OCTOBER

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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LOUIS MEISBURGER, D.D.S., F.A.C.D.
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Original Communications

THE ETIOLOGY OF PARODONTOCLASIA*

By F. V. SIMONTON, D.D.S., San Francisco, California

PARODONTOCLASIA has been defined in a previous article[1] as a condition characterized by a retrograde metamorphosis of the parodontium. Within the scope of this definition are included degenerative changes of the investing tissues resulting from a number of diverse causes.[2] It has been suggested that conditions of which the etiology is known be placed in one group, A, while those in which the fundamental cause has been obscure be classed as group X, as shown in the accompanying table.

The conditions listed under Group A, with the exceptions of Vincent's infection and accidental injury or abuse, lie within the province of the physician. Vincent's infection is a dentomedical problem. The effects of accidental injury and abuse should be recognized as such by the dentist; also the fact that unfavorable conditions may result which predispose to disease.

When parodontoclasia occurs as a local symptom of systemic disease, the observation of the oral condition will usually be made by the dentist. Recognition of the relationship involves den-

*From the California Stomatological Research Group, University of California.

*Read before the Section on Periodontia at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 23, 1926.

1. Simonton, F. V.: Pyorrhea: Definition and Classification, Dent. Cosmos, 68: 158-162 (Feb.) 1926.

2. This definition includes conditions not ordinarily regarded as pyorrhea, but the only way to avoid confusion is to formulate a generic definition. It is then possible, and incumbent on an investigator or essayist, to delimit as a species the entity with which he is dealing.

tomedical collaboration. Cooperative research in this field by the dental histopathologist and the physician is much needed.

to justify a division of parodontoclasia X into an inflammatory type, a noninflammatory type and various combinations of these types. The etiologic

CLASSIFICATION

Parodontoclasia A

1. Phosphorus poisoning
2. Lead or mercury poisoning
3. Vincent's infection
4. Scurvy
5. Systemic disease
6. Accidental injury

Parodontoclasia X

1 Parodontitis	Local	Sialocalcic		
		Irritative		
	Systemic	Irritative		
		Crevicular	purulent	
			nonpurulent	
		Sulcicalcic		
	Mixed			
2. Parodontosis	Local*	Supradynamic		
		Subdynamic		
		Maldynamic		
		Malhygienic		
		Maloperative		
		Accidental		
	Systemic	Nutritional		
		Dyscrasic		
		Senilatrophic		
	Mixed			
3. Complex	Local			
	Systemic			
	Mixed			

*These conditions would, in a sense, fall in Group A, but since they are all exclusively within the province of the dentist, it is more satisfactory to place them here.

The conditions of group X belong within the province of the dentist. They are not to be considered purely from the technical standpoint, but from the biologic as well; in other words, from the dentomedical standpoint.

This paper is concerned primarily with group X. There is much evidence

agencies will be local, systemic and mixed.

THE NONINFLAMMATORY TYPE: PARODONTOSIS

This type will be discussed first because, in spite of the attention which it would seem to merit as a result of the

writings of Talbot and Hopewell-Smith, in the English literature, and of a number of European investigators, it has not received much consideration in this country.

Fig. 1.—Dental tissue from normal 3-year-old dog, showing septal process between the upper second and third incisors.

Fleischmann and Gottlieb[3] make the following important statements (p. 386): "In harmony with Talbot and Hopewell-Smith, we can decide on the basis of our observations that an atrophy of the bone is the causal and primary factor in the etiology of pyorrhea alveolaris," and "The atrophy of bone is surely due to a constitutional factor." Hopewell-Smith[4] states that "It (pyor-

3. Fleischmann, L., and Gottlieb, Bernhard: A Contribution to the Histology and Pathogenesis of Pyorrhea Alveolaris, Dent. Cosmos, 63: 215-226 and 375-386 (March) 1921.

4. Hopewell-Smith, Arthur: Normal and Pathological Histology of the Mouth, Vol. 2, Pathological Histology, Ed. 2, Philadelphia: P. Blakiston's Son & Co., 1918-1920; p. 287.

rhea alveolaris) is essentially dependent upon an osseous lesion, *an atrophy of the bone,* which in the thinnest parts causes the cervical margins of the teeth to become denuded through the halisteresis and osteoclastic absorption."

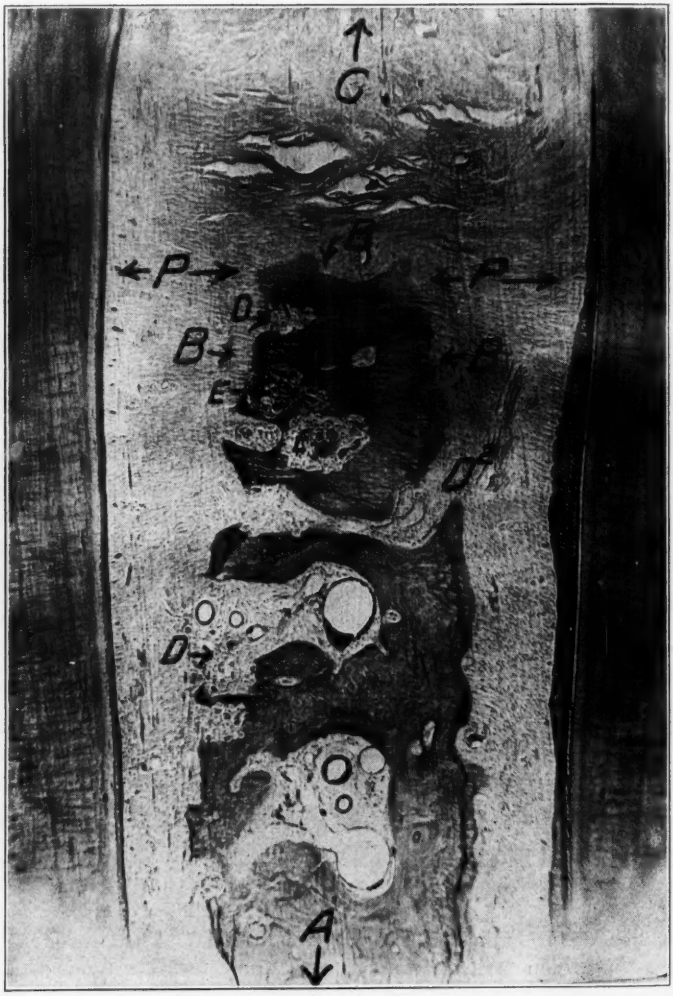

Fig. 2.—Tissue removed at biopsy from 3½-year-old dog, subjected for 130 days to a diet in which the alkaline ions were in excess. The process between the upper right second and third incisors is shown. The profound degeneration of the bone through halisteresis, osteoporosis and lacunar resorption may be noted.

In "Diffuse Atrophy of the Alveolar Bones,"[5] a study based on microscopic examination of human tissues, Gottlieb further discusses this condition, mentions apparent causes in certain cases and suggests theories to explain others.

Kantorowicz[6] describes two types of "pyorrhea." One of these, which he designates *paradentitis* (parodontitis), is characterized by: (1) inflammation of the gingivae; (2) deepening of the gingival sulci, with a serous purulent

Fig. 3.—Tissue removed postmortem from the same animal as in Figure 2, seventy-six days after the removal of biopsy material, shown in Figure 2, and twenty-eight days subsequent to a reversal of the dietary reaction, the acid ions now being in excess. The upper left second and third incisors are shown. Evidences of marked regeneration of septal bone may be noted.

5. Gottlieb, Bernhard: Zeitschr. f. Stomatol., April, 1923.

6. Kantorowicz, Alfred: Klin. Zahnheilk., 1924.

secretion which can be expressed by pressure; (3) subgingival calculus; (4) atrophy of the alveolar process, and (5) loosening of the tooth.

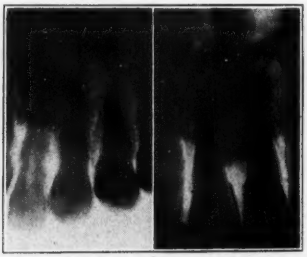

Fig. 4.—Parodontosis in a man, aged 25.

The other type, the *paradentose* (parodontosis), includes dystrophies marked by loss of vital energy of the parodontium, but accompanied by little inflammation or infection. Four species are distinguished: (1) presenile atrophy; (2) dystrophy from occlusal trauma; (3) dystrophy from lack of occlusion, and (4) diffuse atrophy.

Fig. 5.—Parodontosis in a woman, aged 26.

Weski[7] distinguishes a total atrophy, including precocious and senile atrophy and a partial atrophy with and without an ulcerating pocket.

7. Ostman, B.: Svensk Tandläk. Tidskr., 18: 103, 1925.

Grieves[8] reported the following conditions in rats on experimental diets: molars: (1) caries-like lesions; (2) loss of attaching tissues and teeth, or both; incisors and molars: (3) fracture; incisors: (4) osteodentin and exposure of pulp; (5) overgrowth; (6) loss of maxillary and mandibular areas.

Fig. 6.—Parodontosis in a man, aged 36.

Under the molar group headed "loss of attaching tissues and teeth or both," he reports osseous defects of two types, one, the atrophic type with progressive horizontal and regular loss of the alveolar crests, the adjacent cortex being hard, rounded and smooth; the other, the infective type with irregular vertical invasion of the alveoli and localized root exposure, in which the cortex is

Fig. 7.—Parodontosis in a man, aged 36.

8. Grieves, C. J.: A Preliminary Study of Gross Maxillary and Dental Defects in Three Hundred Rats on Defective and Deficient Diets, J.N.D.A., 9: 467-497 (June) 1922.

rough, soft or missing as in true exudative gingival lesions.

Howe[9] has done much experimental work with scurvy-producing diets. In guinea-pigs on such a diet, he reports

Fig. 8.—Parodontosis in a man in the early thirties.

The teeth become loose, the gums bleed and in cases of long standing a good flow of pus occurs. The structure of the teeth is markedly affected.

. . . . the alveolar process is absorbed, the teeth become very loose and protrude from their sockets and the articulation is disarranged. Inflammatory and degenerative changes occur in the peridental tissues; indeed the condition closely resembles pyorrhea.

. . . . by keeping the animals for some time upon a vitamin-deficient (water-soluble C) diet, considerable areas of the jaw become

Fig. 9.—Parodontosis in a man in the early thirties.

decalcified. Upon a return to a normal diet large plaques of new bone formed. One lower jaw is almost wholly encrusted with new bone. This eventually becomes smoothly laid down.

Martha R. Jones,[10] in studies on inorganic salt metabolism in dogs, has

Fig. 10.—Parodontosis in a man in the early thirties.

shown that skeletal changes and dental defects may be induced in normal puppies fed on diets which appear to be adequate in respect to protein, fat, carbohydrate, inorganic salts and vitamins (bread, meat, milk, butter fat, orange juice and salt mixture based on ash analysis of milk), but which contain an excess of basic ions through the addition of

Fig. 11.—Paradontosis in a man, aged 25.

sodium carbonate. Subsequently to this report, a cooperative study of the dental

9. Howe, P. R.: Report on Studies of the Effect of Vitamin-Deficient Diet upon the Teeth, Dent. Cosmos, 63: 1086-1092 (Nov.) 1921.

10. Jones, Martha R.: Proc. Soc. Exper. Biol. & Med., 21: 199-202, 1924.

tissues of these experimental animals was undertaken by Dr. Jones and me, and in "Changes in the Alveolar Process About the Teeth in Dogs on Experimental Diets,"[11] we discussed some

Fig. 12.—Parodontosis in a man, aged 25.

of the microscopic appearances in the parodontal bone in these puppies and in adult dogs. Further work along the line of applying experimental diets to adult dogs and puppies is now in progress, and a report of chemical and microscopic findings will be made at a later date.

Figure 1 presents control tissue corresponding to that of Figures 2 and 3.

Figure 2 shows a section of tissue

Fig. 13.—Local parodontosis, traumato-irritative and maloperative.

removed at biopsy from one of the animals, a normal adult dog, 3½ years of age, 130 days after the animal had been placed on a diet in which the alkaline ions were in excess (bread, meat and potato, the latter predominating, with the addition of sodium carbonate to further increase the alkalinity). At the time of biopsy, the animal appeared to be robust, well nourished and in good health.

The roots of the upper right second and third incisors are shown at *R* and *R. C.* lies in the direction of the crowns, *A* toward the apices of the roots. The septum of the alveolar process shows marked retrogressive changes. Halisteresis has occurred at *B-B-B.*

Fig. 14.—Local parodontosis, traumato-irritative and malhygienic.

Lacunar resorptions are evident at *D-D.* At D^2 a complete division of the septum (in the plane of this particular section) has occurred. Osteoporotic changes are evident in the marrow spaces. Multinuclear osteoclasts may be seen at *E-E.* Widening of the pericementum is apparent at *P-P.* This results from the narrowing of the septum through resorptive changes. The freedom of the soft tissues from any evidence of inflammatory processes is notable.

Subsequent to the biopsy, omission was made of the sodium carbonate from

11. Jones, Martha R., and Simonton, F. V.: Proc. Soc. Exper. Biol. & Med., to be published.

the food mixture during the following forty-eight days. Reversal of the dietary reaction was then effected by the substitution of an equivalent amount of rice for the potato. Twenty-eight days after this change in diet, the animal succumbed.[12]

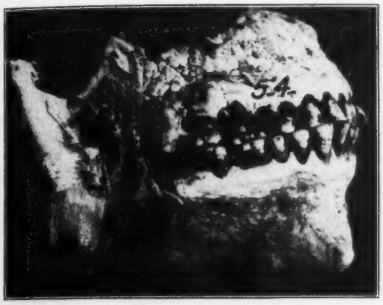

Fig. 15.—Tissue from an aged Mexican having sialocalcic parodontitis.

Corresponding tissue (the upper left second and third incisors) was removed postmortem.

In Figure 3, marked reconstructive changes are evident. The roots of the upper left second and third incisors are shown at *R* and *R*. The subperiosteal bone (*B-B*) is fairly abundant. Along the crest (*C*), new bone formation is taking place. Under higher magnification, osteoblasts may be seen embedded along the margin as bone corpuscles, many appearing between the margin of the bone and the outlying blood vessels. The superficial bone corpuscles are large

Fig. 16.—Labiolingual section of lower left cuspid, *3*, shown in Figure 17.

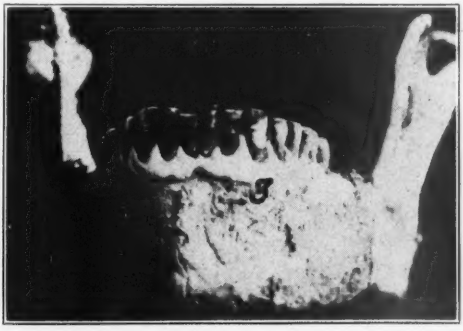

Fig. 17.—Anterior view of the mandible from which the section in Figure 16 was taken.

12. Jones, Martha R.: Studies on Inorganic Salt Metabolism. II. The Effect of the Sudden Alteration of the Acid-Base Balance on Dogs, Proc. Soc. Exper. Biol. & Med., 23: 578-581, 1926.

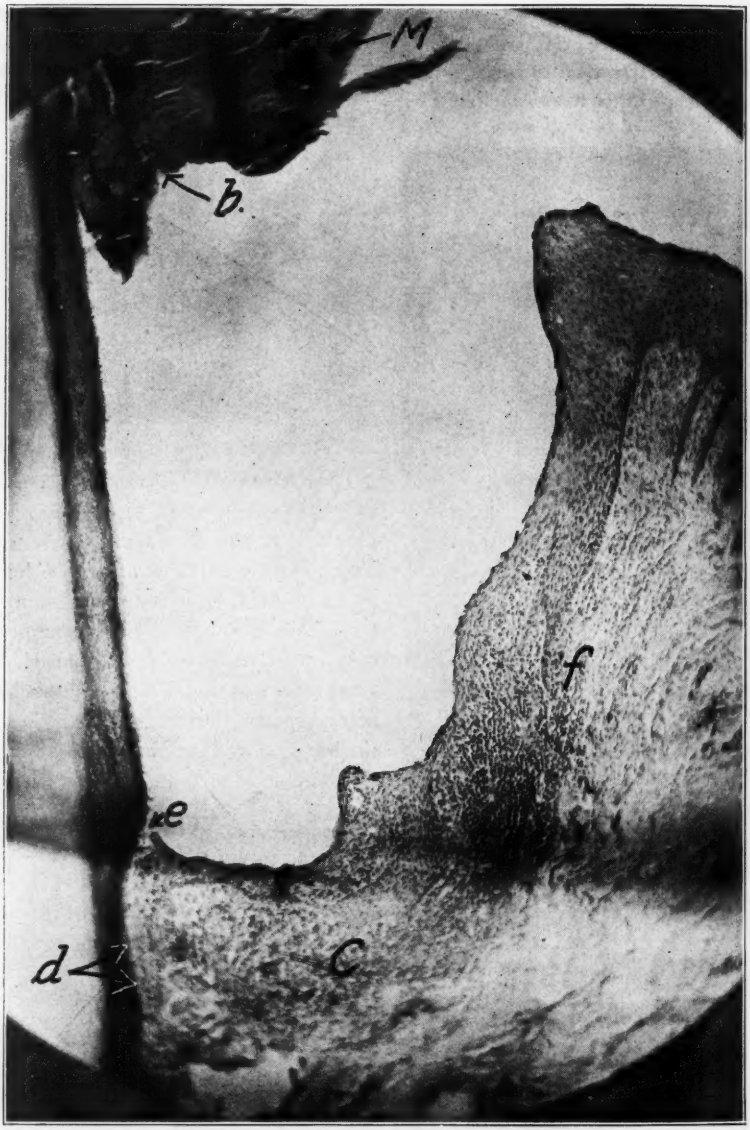

Fig. 18.—Gingival region and matrix of calculus, a low power photomicrograph of region *A* Figure 16.

and their nuclei regular in outline and clearly defined. At *E* may be seen old dead bone overlaid by new. At *F*, two marrow spaces which had previously

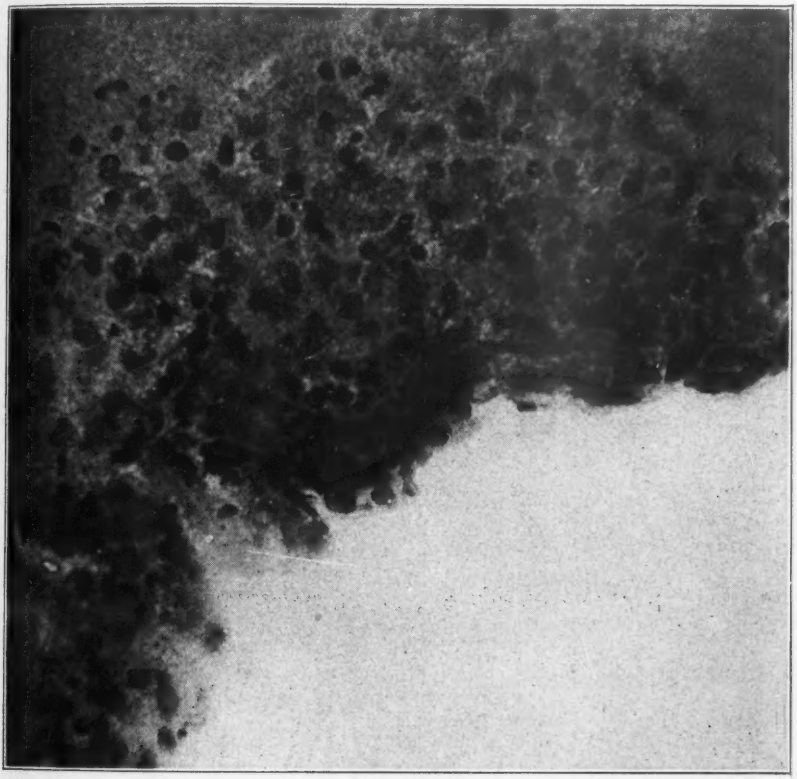

Fig. 19.—Margin *b*, Figure 18, of matrix of salivary calculus. The mass of degenerating epithelial cells may be noted.

coalesced have been separated by bone growth between them. Sections of the long bones showed no apparent recent changes of the osseous tissue.

In this cooperative study, we drew attention to the following important points:

1. The condition shown in Figure 2 represents a noninflammatory type of parodontoclasia in a dog.

2. The occurrence of the retrograde changes in Figure 2 in relation to a diet known to produce osseous degeneration, together with a reversal of the type of bone change with a reversal of the dietary fault, postulates that nutrition is an important etiologic factor.

3. The microscopic appearance of

the tissues shown in Figure 2 resembles diffuse atrophy in human tissues as described by Gottlieb.

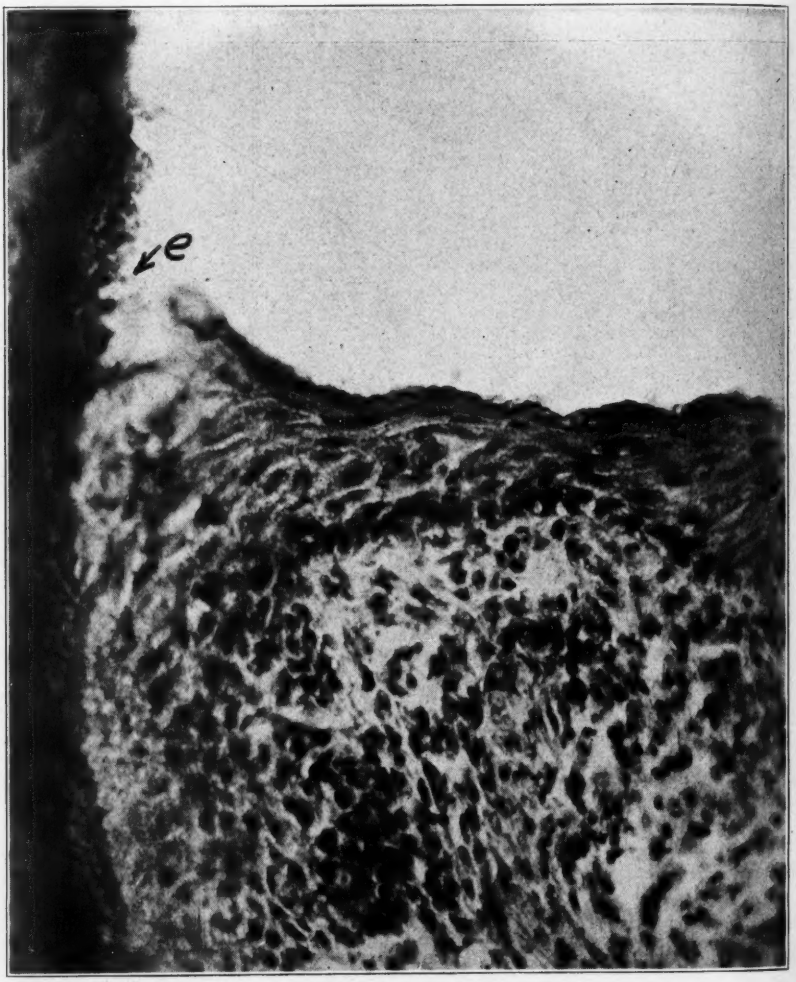

Fig. 20.—Subepithelial infiltration of plasma cells. Enlarged from Figure 18.

4. The condition described as resulting from the basic diet occurred without any obvious degenerative changes in the long bones and in an animal apparently in good health, robust and well-nourished. This is in conformity with the occurrence of parodontoclasia in human beings who seem to be in perfect health.

5. The freedom from inflammatory reaction of the soft tissues may be due in part to the high resistance to infection characteristic of the tissues of the dog, and in part to lack of function. The dogs were fed on pap, requiring

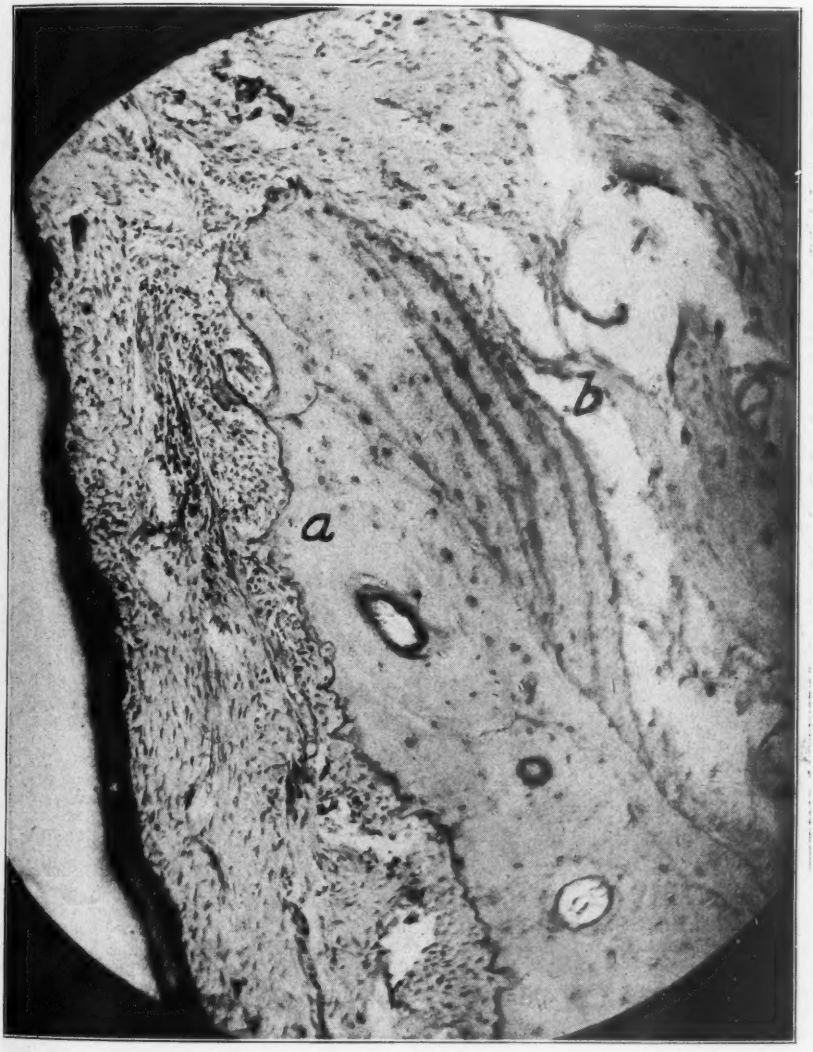

Fig. 21.—Crest of the alveolar process from region *A*, Figure 16. Changes in the bone in response to movement of the tooth, due to alterations in stress, may be noted.

practically no mastication. It is possible that vigorous use of the tissues in which the skeletal support was so defective would lead to trauma, hemorrhage and invasion of micro-organisms.

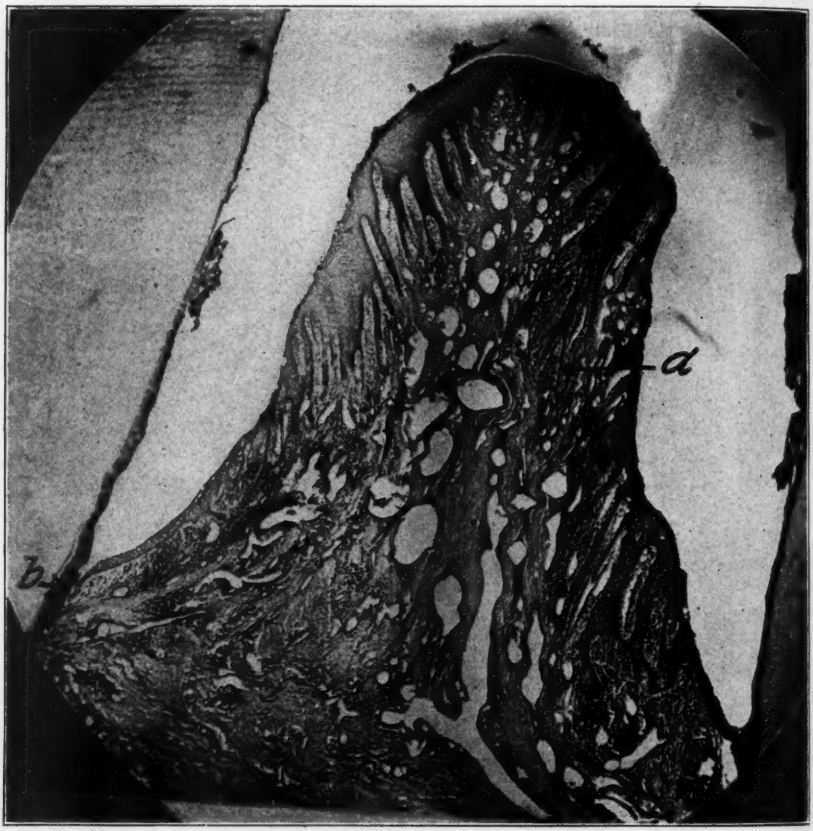

Fig. 22.—Septal gingiva between the upper right bicuspids of the case shown in Figure 15. The dilated and thrombosed blood vessels, the numerous epithelial papillae, and also the limited indipping of epithelium along the cementum of the two teeth may be noted, as well as the bundle of intact fibers at *b*, preventing any further penetration of the epithelium. The inflammatory process follows the directional influence of the fibrous masses.

6. The bone changes represented in Figure 2, namely, resorption of the crest of the alveolar septum, lateral excavations, opening of the bone marrow spaces to the side, osteoporosis, coalescing of marrow spaces and widening of the sockets of the teeth crownwise, all compare with the appearances familiar to parodontists in radiograms of human parodontoclasia.

Since there is an important school of

thought which interprets "pyorrhea" as an inflammatory syndrome, and since infection is apt to dominate the symptom-

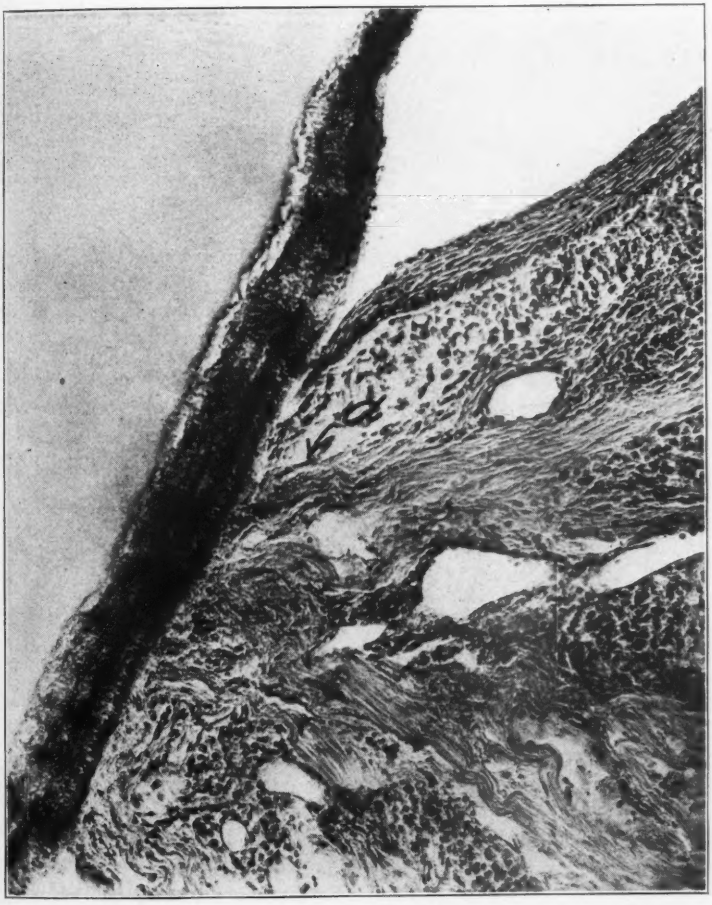

Fig. 23.—Higher magnification of *b*, Figure 22. The intact horizontal fibers at *a*, also the inflammatory infiltrations following the directional influence of the fibrous bundles may be noted.

atology of human cases of parodontoclasia and to mask other possible factors, it seems well to consider the foundation upon which the type "parodontosis" is established. In order to avoid misunderstanding through ambiguity or confusion, it seems desirable to define the entity under discussion. By the term parodontosis, we intend to

designate a condition characterized by a retrograde metamorphosis of the parodontal bone, but in which inflammation, if present, is secondary or sequential.

we have had to deal in the treatment of "pyorrhea," for the local factors have been absent or inconsequential and the dentist has had no knowledge leading

Fig. 24.—Thrombosed blood vessel with disintegrating walls, from septal gingiva shown in Figure 22. The blood vessels about the thrombus are markedly dilated.

The systemic parodontosis has been called diffuse atrophy by Gottlieb, and *parodontoclasia obscura* by me. It is the most recondite condition with which

to any rational attempt at its control. Gottlieb, as has been stated before, believes that "it is surely due to some systemic factor." Elsewhere, he expresses

the opinion that this systemic factor is not a constitutional disease. We believe that it is nutritional.

Dentists are probably all familiar with cases of parodontoclasia in which

Fig. 25.—Sialocalcic parodontitis. The margin of process parallels the edge of the calculus. The condition of this bone is excellent.

the bone of the alveolar process seems to melt away and in which there are no local factors at all commensurate with the destruction. In many of these cases, there is no evidence of inflammation.

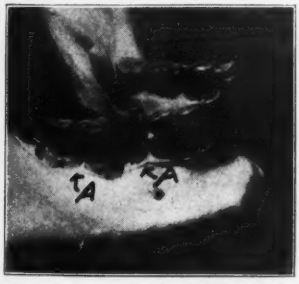

Fig. 26.—Sialocalcic parodontitis. The everted edge of process along the margin *A-A* may be noted, as well as the reversed arc across the occlusal surfaces of the first molars and the obverse arc across the occlusal surfaces of the third molars.

REPORT OF CASES

Figure 4 shows such a case in a young man, aged 25, in perfect health as far as expert medical diagnosis could reveal, but rather stout and showing the first stages of baldness. The upper anterior teeth were quite loose. The mouth was clean and the gums were free from any clinical signs of inflammation. There is evidence of calculus in the radiograms. This had been removed about two and one-half years previously, the occlusion on the anterior teeth relieved, and a dietary régime instituted which conformed with our orientation on the subject at that time. The diet was intended to supply an abundance of vitamins and inorganic salts. The patient had been on quite a good diet, which he now supplemented by such items as a head of lettuce a day, milk three times a day (he had previously been accustomed to milk about twice a week), and a tablespoonful of cod liver oil once a day. Later, the cod liver oil was restricted to three doses a week, as the patient was putting on too much weight. During this period, search for micro-organisms within the tissues by a special aspiration technic adapted by Dr. Beckwith[13] proved repeatedly negative.

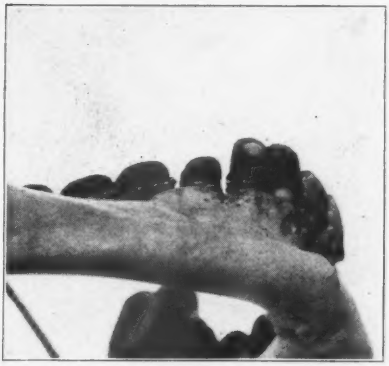

Fig. 27.—View taken from obliquely below the mandible. The overlapping edges of calculus may be noted.

In the light of subsequent work, it appeared that this type of parodontoclasia called

13. Beckwith, T. D.: Presence of Bacterial Micro-organisms Within Human Gingival Tissue in Gingivitis, Proc. Soc. Exper. Biol. & Med., 23: 140-143, 1925.

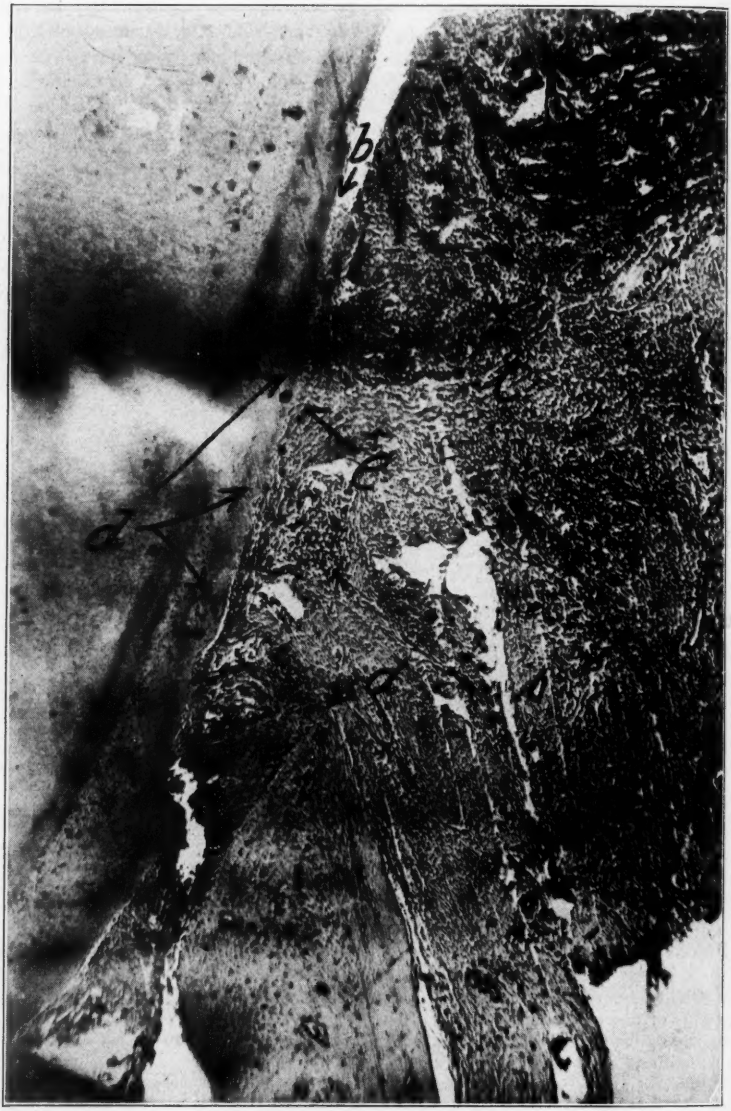

Fig. 28.—Sialocalcic parodontitis, showing bone in good condition in close relation to the gingival sulcus and to a marked inflammatory process. The intact horizontal fibrous bundle at *e* and new cementum at *d* are to be noted.

for a differently planned dietary. Accordingly, June 4, 1926, there was instituted a régime planned by Dr. Jones and based upon her experimental findings.

At the last examination of the mouth, June 4, it was found to be less clean than heretofore. This was partly due to some neglect of hygiene by the patient, but doubtless due in part also to other factors. It is of great interest—apropos of Gies' recent studies of milk drinking relative to formation of salivary calculus—to note that salivary calculus is forming in this mouth rather noticeably at the present time. The milk is to be discontinued, and buttermilk, once a day, substituted.

The patient has smoked a pipe for six years. It was thought that this may have been a prominent factor in causing loosening of the teeth, but the pipe stem was usually held between the bicuspids. Furthermore, the tooth most affected was the upper left lateral incisor, whereas the pipe was usually carried on the right side. Information from patients on such points is notoriously unreliable (not intentionally so), and the loosening of the teeth may be attributed in part to this cause.

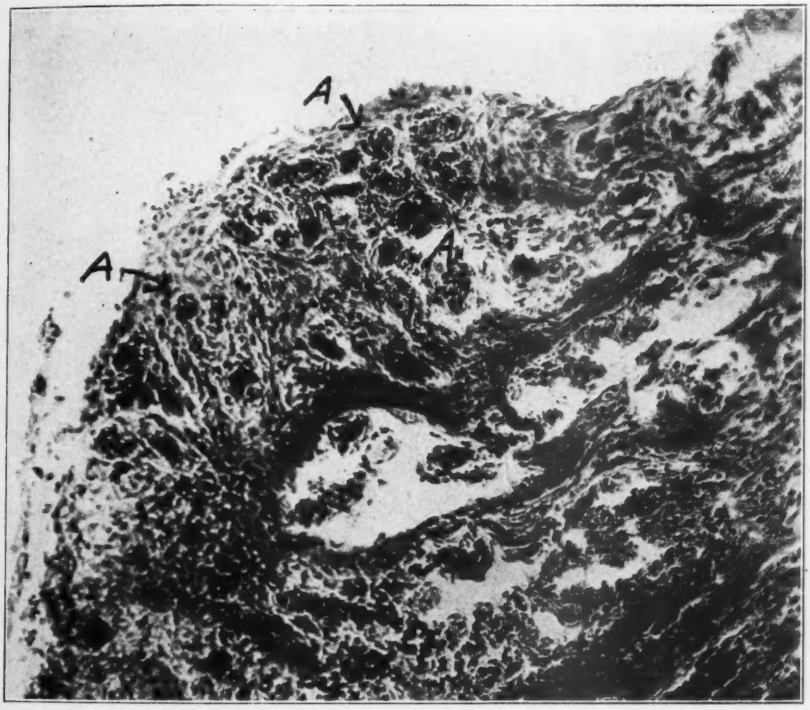

Fig. 29.—Inflammatory process in gingiva of Figure 28. There are numerous hemorrhages, with round-cell infiltration and destruction of epithelium.

Figure 5 illustrates the case of a woman, aged 26. There is marked destruction of the alveolar process, although clinically the gums were free from inflammation. The bicuspids were particularly involved, though there was little or no detachment. Pregnancy may have been a complicating factor. The patient

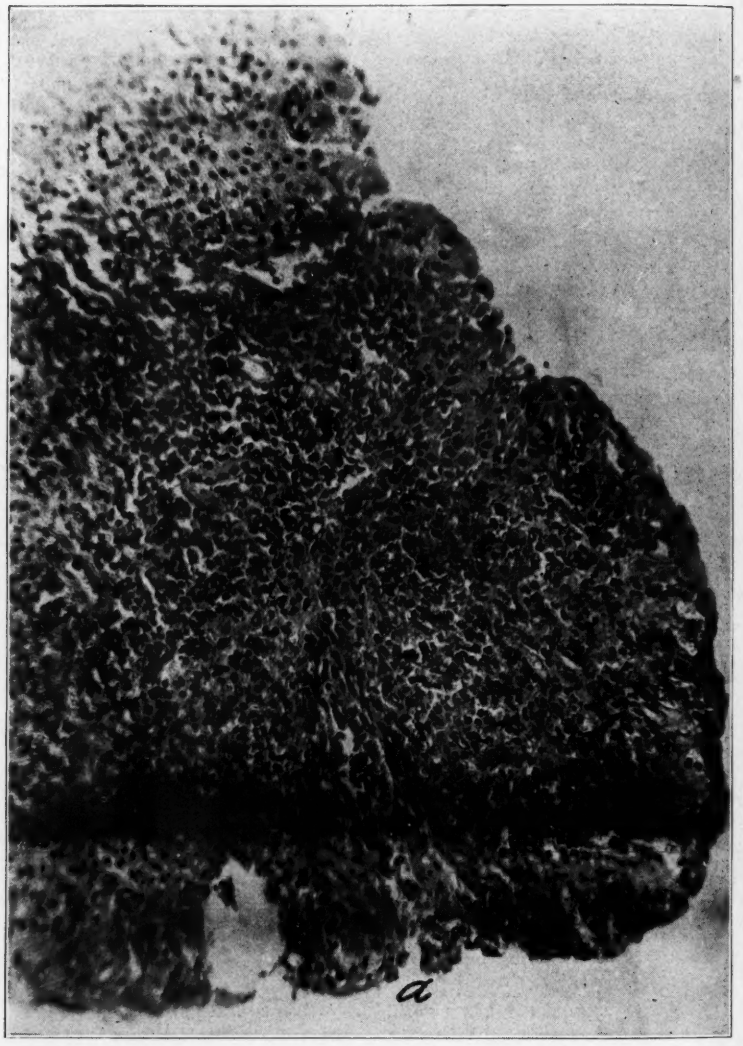

Fig. 30.—Tissue from under a large piece of salivary calculus. The epithelium is so infiltrated as to be almost indistinguishable. Ulceration is occurring at *a*. In this region may be distinguished erythrocytes, numerous polymorphonuclear leukocytes and lymphocytes. The epithelial cells are degenerating, some are moribund. For considerable areas, the nuclei of the epithelial cells have disappeared, leaving a vacuolated and granulated cytoplasmic syncitium. More centrally placed are groups of plasma cells. Blood vessels are small but numerous. There is much hemorrhage.

was given to a diet low in protein, high in carbohydrates and low in minerals.

Figures 6 and 7 illustrate the case of a man, aged 36. Bone destruction is marked. The gums were healthy and of good tonus. There has been much loss of bone about the bicuspids, but there were no detachments. The margins of the process could be palpated a considerable distance apically of the gingival line.

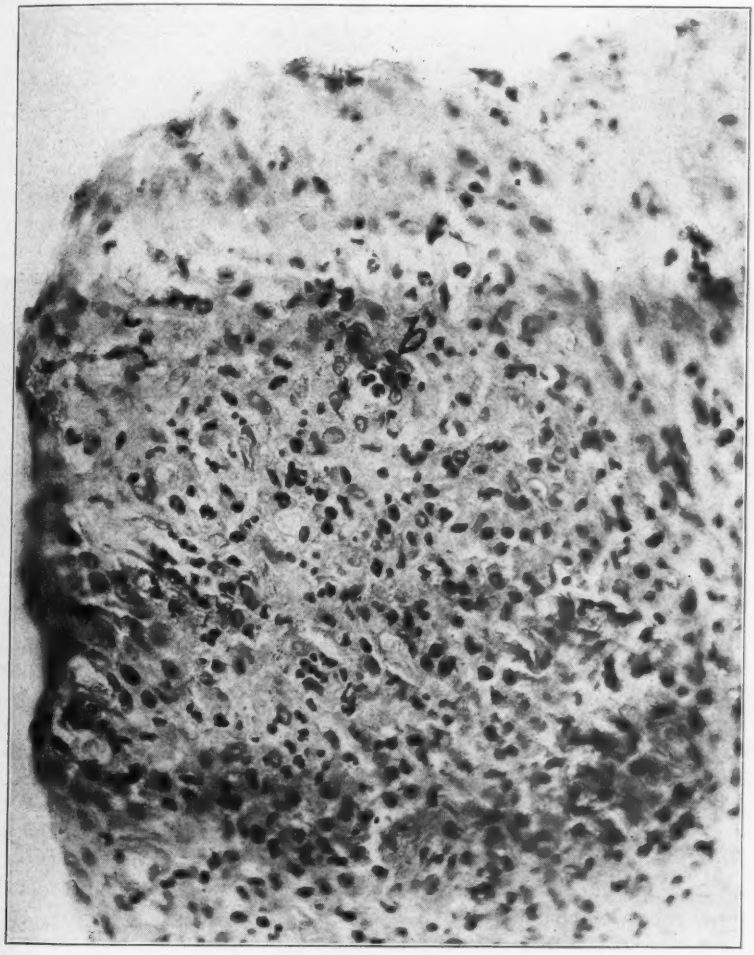

Fig. 31.—Higher magnification of the section shown in Figure 30.

In Figures 8-10, the bone seems to have "melted away." The patient, a man in the early thirties, in perfect health, had a history of recent Vincent's infection. Figures 11

and 12 show still another case of advanced bone resorption with no clinical evidence of inflammation.

The appearance of the crests of the septums in these pictures, i. e., the fading out into radiolucency, corresponds with what we would expect in radiograms of halisteretic processes.

I have not yet procured human tissues for microscopic preparation from such cases as described above. I believe that, as nearly as may be decided from a study of printed representations of microscopic observations, tisssue from

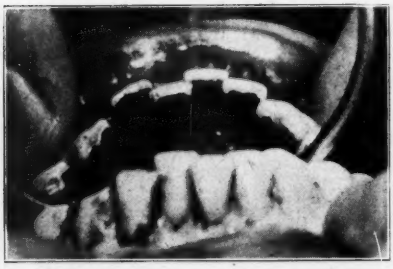

Fig. 32.—Heavy overlapping masses of salivary calculus on lingual surfaces of lower anterior teeth.

such cases would conform with the microscopic findings of Gottlieb from human tissue. Our material from the experimental animals seems to conform with that figured by Gottlieb, from the human being, in the following respects: 1. Halisteresis of the crests of the septum. 2. Fibrosis. 3. Coalescence of marrow spaces. 4. Somewhat distributed resorptive processes. 5. Resorption of root ends. 6. Relative freedom of the soft tissues from inflammation.

The halisteresis described as occurring in the experimental material is regarded as the most important and univocal sign. It represents a definite pathologic change, whereas osteoclastic resorption may be merely physiologic.

It should be noted that Hopewell-Smith and Roys[14] stress halisteresis as the significant bone change in "pyorrhea."

It is of interest in this connection that Pitts,[15] in a recent article, recognizes a striking correspondence between the diffuse atrophy of Gottlieb and the rarefying pericementitis fibrosa of Box.[16] I am inclined to think that the rarefying pericementitis fibrosa of Box is connected with the inflammatory

Fig. 33.—Salivary and serumal calculus. Eroded areas are also covered with deposits.

syndrome and is not identical with the diffuse atrophy of Gottlieb. This will be referred to again in connection with systemic parodontitis.

Parodontosis may be local, systemic or mixed. Local parodontosis includes the following: 1. Atrophy from lack of occlusion (subdynamic). 2. Atrophy from faulty or excessive occlusion (maldynamic; supradynamic). 3. At-

14. Roys, Maurice: Dent. Cosmos, 60: 659 (Aug.) 1918.

15. Pitts, A. T.: Gottlieb's Theories on the Mechanism of Eruption and Its Bearing on the Pathology of Pyorrhea, Brit. Dent. J., 47: 497 (May 1) 1926.

16. Box, H. K.: Studies in Periodontal Pathology, The Canadian Dental Research Foundation, (May) 1924.

rophy from injury (malhygienic;[17] accidental; maloperative).

The local parodontoses, although they present many interesting features, will not be given special consideration in this paper, aside from one case of particular value, since the means for their control lies within our present knowledge and skill. Although the local conditions are the more important, systemic factors will exercise influences of which cognizance must needs be taken in our treatment. Every dentist knows that patients react quite differently to various abnormal dental stresses. In some, the bone yields, while in others it reacts to cope successfully with the conditions.

Figure 13 illustrates a case which puzzled me for some time. The patient, a robust young lady, had been accustomed to an excellent dietary, yet the alveolar process about certain teeth, as may be seen, was devastated. The sockets were filled with granulative masses. The mouth was clean and the gums generally were free from inflammation. It will be noted that rather large fillings are present in these teeth. They represent some of the finest foil operations that I have ever seen. Having occasion to remove one of them, I was struck by its extraordinary density. They were placed by an operator of consummate skill, yet the only explanation that can be offered for the bone conditions in this otherwise healthy mouth is trauma through excessive malleting on the teeth of a young person.

Fig. 34.—Salivary calculus in unusual positions. The deposits on the mesial surfaces of the lower cuspid and bicuspid may be noted.

Fig. 35.—In this case, scalelike deposits of salivary calculus covered the buccal, occlusal and lingual surfaces of the molar teeth. Hygiene was entirely neglected. A mass of food débris may be seen lodged in the buccal embrasure at *a*.

It may be pointed out here that atrophies of the gum (gingivoclasia) and of the margin of the process are very common in persons who conscientiously brush their teeth but who use a faulty technic (vigorous cross-brushing). Some little damage may be done in this way. The resulting recessions may also lead to "senile" caries. Figure 14 shows a case of atrophy due to faulty brushing. (Excessive brushing of the labial surfaces of anterior teeth, especially the

17. Hygiene is here used in the sense of connoting the artificial care of the teeth by the patient—brushing of the teeth.

larger areas where caries does not occur, gives these surfaces a smoothness and luster which is esthetically undesirable.)

Systemic parodontoses will include: 1. Nutritional parodontosis (parodontoclasia obscura). 2. Atrophy due to other possible systemic factors (endocrine?) at present unknown (parodontoclasia obscura). 3. Senile atrophy. but pathologic.

Nutritional parodontosis has been discussed.

Senilatrophy may result from changes attendant on old age as such, or may merely represent wastage through an accumulation of the effects of small injuries during the passage of the years.

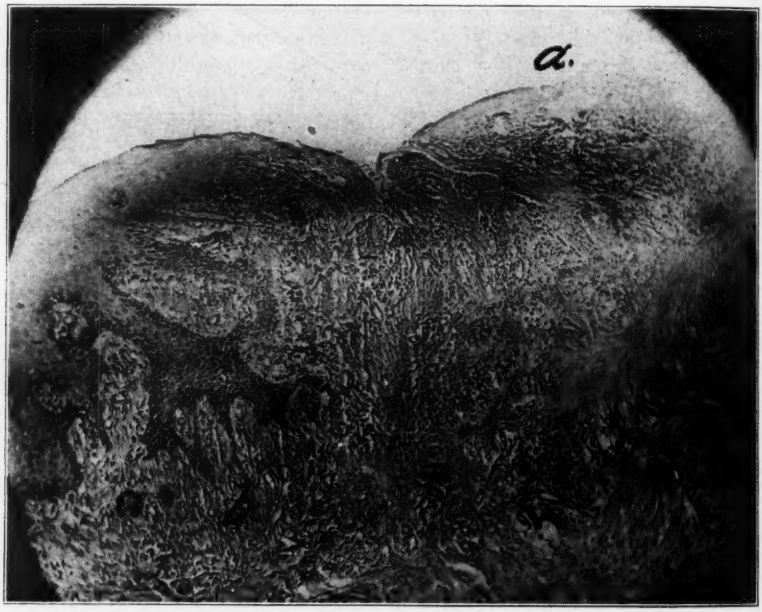

Fig. 36.—Irritative parodontitis, chemobacterial. A lingual gum crescent from a healthy 14-year-old girl. There is considerable infiltration in this tissue. There is ulceration at *a*. The infiltrating cells are lymphocytes and plasma cells. The fantastic shape of the epithelial papilla at *b* may be noted, this doubtless reacting to the toxins.

I am not inclined to consider as such the presenile atrophy of Kantorowicz and others. I regard the expressions as misleading. Precocious senility, as discussed elsewhere,[18] is not physiologic

18. Simonton, F. V.: Is Evolution a Factor in Parodontoclasia? Dent. Cosmos, 68: 542-543 (June) 1926.

PARODONTITIS

I cannot agree with those authors who believe that all "pyorrhea" begins as a marginal atrophy of the bone, for there is much evidence of a true inflammatory type in which the loss of bone is secondary. Paradontosis, though less

common than the inflammatory type, has been more important from the standpoint of research, because the dentist has been able to cope with the latter by local treatment, while he has been able to do but little to combat the former.

Study of material from a number of human and animal cases indicates that much inflammation may exist with little or no bone destruction. The evidence of research on the bacteriology of parodontoclasia[19] supports the view that the inflammation is secondary to a lowering of resistance of the soft tissues which permits resident organisms to invade. The factors which produce loss of tone are in all probability endogenous. Changes of saliva, which may be brought about by the same or other endogenous factors, would doubtless affect the balance of the micro-organic flora and vary relative dominance and virulence.

Local irritants are exciting factors which initiate degenerative changes where susceptibility exists, but which may be impotent if susceptibility is absent. They may be expected to paint in the details of the clinical picture.

It is not possible to separate completely the local and systemic factors in parodontitis. It is useful and convenient to consider under different headings those conditions in which one or the other is dominant.

Local Parodontitis.—1. Sialocalcic. 2. Irritative. (In those cases in which the systemic resistance is sufficiently high, a purely local condition will usually result.)

Systemic Parodontitis.—1. Irritative. (Where the resistance is low, irritants are important exciting factors.) 2. Sulcicalcic. 3. Crevicular (purulent, nonpurulent).

Sialocalcic Parodontitis.—Material was procured from a case in which the systemic resistance was very high. The destruction that occurred seems wholly attributable to the deposits of salivary calculus. The specimens were procured postmortem from a Mexican, aged 69 years and 9 months, the cause of whose death was entirely unrelated to the dental condition. The following is a statement from the medical examination:

> The weight was 140 pounds. The father died at the age of 69, through accident; the mother, aged 65, from typhus fever. There are four brothers and one sister living, three brothers and three sisters dead. The wife, aged 65, and five sons are living.
>
> No operations had been performed. The bowels were regular. No alcohol or drugs were used. There has been no weight lost lately. No blood was present in the sputum and there was no chronic cough. Weakness and nervousness constituted the only complaint. The hair was abundant, coarse and gray. The heart sound was clear and regular, with no murmur and a rate of 60. The Wassermann reaction was negative. The physical condition was good.

The teeth were remarkably well preserved. In spite of poor hygiene, long years of heavy usage, and much occlusal wear, they remained in function throughout the "allotted span of life"

19. Meyer, K. F.: Present Status of Dental Bacteriology, J.N.D.A., 4: 966-996 (Sept.) 1917. Glynn, E. E.: Organisms Found in Periodontal Infections, and Their Relation to "Toxaemia," Brit. Dent. J., 44: 39 (June 15), 44 (July 2) 1923. Howe, P. R.: Experimental Pyorrhea, J.N.D.A., 6: 413-421 (May) 1919. Ophüls, W. C.: Private communication to author. Hall, I. C.: Bacterial Factors in Pyorrhea Alveolaris. III. The Isolation of B. Tetani, B. Welchii and Other Sporulating Anaerobes from Human Saliva, J. Infect. Dis., 37: 87-92 (July) 1925. Appleton, J. L. T., Jr.: Bacterial Infection, with Special Reference to Dental Practice, Philadelphia, Lea & Febiger, 1925.

to the seventieth year. With the exception of the third molars, the teeth were entirely free from caries. There was a large cavity in the upper right

The excised specimens are shown in Figure 15.

Figure 16 is a photograph of a longitudinal section cut labiolingually

Fig. 37.—Inflamed tissue of interdental gingiva of a 14-year-old girl.

third molar in a region that was habitually covered with food débris due to the close apposition of the soft tissues in that locality. The upper left third molar was slightly decalcified in a corresponding position. Only remnants of the roots of the lower third molars remained.

through the lower left cuspid and its parodontium (Fig. 17 at *3*).

The clinical examination showed considerable recession exposing the cementum on the labial and lingual. The mesial and distal gingivae are quite high. The labial gum is pigmented. The deposit of salivary calculus spreads

around the tooth, penetrating a short distance between the gum and tooth on the labial and lingual. On the proximal surfaces, thin layers of calculus extend several millimeters beneath the gingivae.

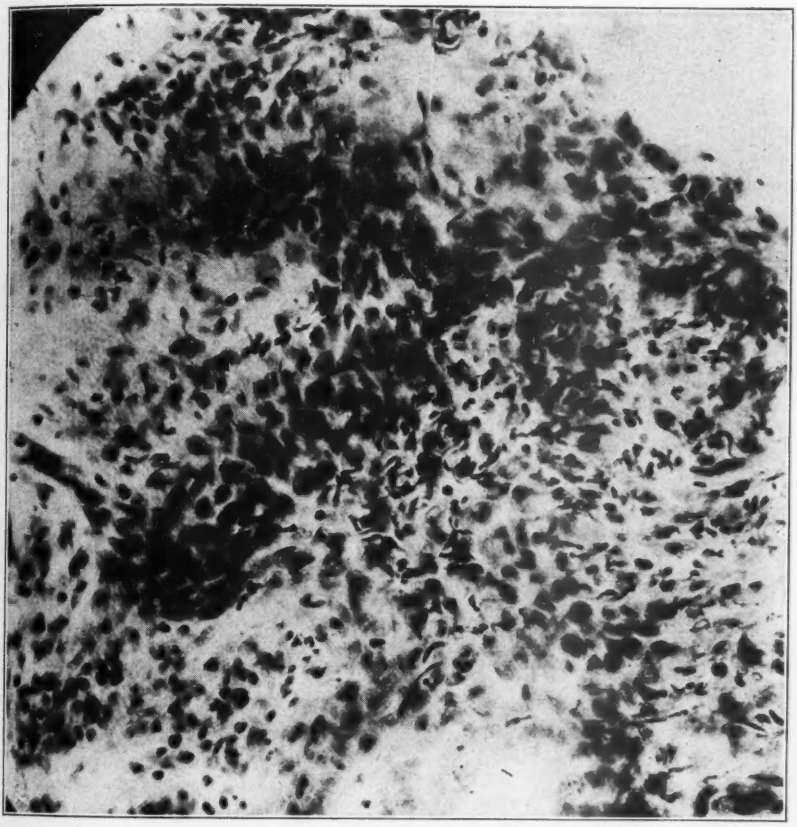

Fig. 38.—A section of hyperemic interdental gingiva of a 14-year-old girl, showing an inflammatory process about epithelial papilla (a higher magnification of this tissue is shown in Figure 37).

On observing Figure 16, it will be noted that the investing tissues have receded for about one-third the length of the root. The alveolar process approaches closely the gingivocemental attachment. It is quite compact. The pericementum is thin and does not widen at the orifice of the alveolus.

Figure 18 is a low-power photomicrograph of region *A*, Figure 16. The matrix of a deposit of calculus may be seen at *M*. The margin of this matrix

presenting toward the gum is composed of degenerating epithelial cells staining pink with eosin. These gradually blend into a granular blue region, presumably more completely calcified. Figure 19 is a higher magnification of the matrix at *b*, Figure 18.

of the epithelial papillae may be seen at *f*.

The infiltration is of the plasma cell type: fibroblasts are numerous. The crest of the alveolar process (Fig. 21) presents several points of interest. A series of Howship's lacunae may be

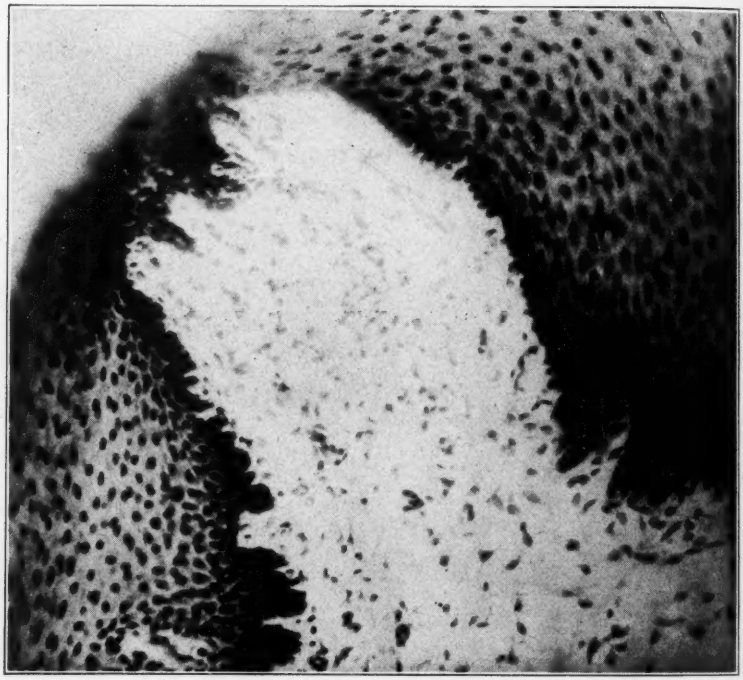

Fig. 39.—Buccal gum from sheep; tissue subject to lodgments of food débris but not irritated thereby owing to the nature of the food and its failure to ferment under the conditions present in the mouth.

Infiltration in the gingiva is apparent at *C*, Figure 18. There is a slight downgrowth of epithelium along the cementum at *d*. The epithelial covering of the sulcular surface of the gingiva is intact. The crevice at *e* is an artefact, a microtome tear. Deepening seen along the inner margin at *a*, but widening of the pericementum has not resulted. The resorptive process has ceased and there are indications of repair to follow. The outer surface of the crest has been thickened by a number of subperiosteal laminae, as has also

the outer wall of the process at *b* (Fig. 16). These changes appear to be in response to tooth movement through occlusal wear and alterations in stress, showed salivary calculus. The gum margins are slightly swollen. The interdental papilla is somewhat blunted and has receded about 2 mm. Salivary

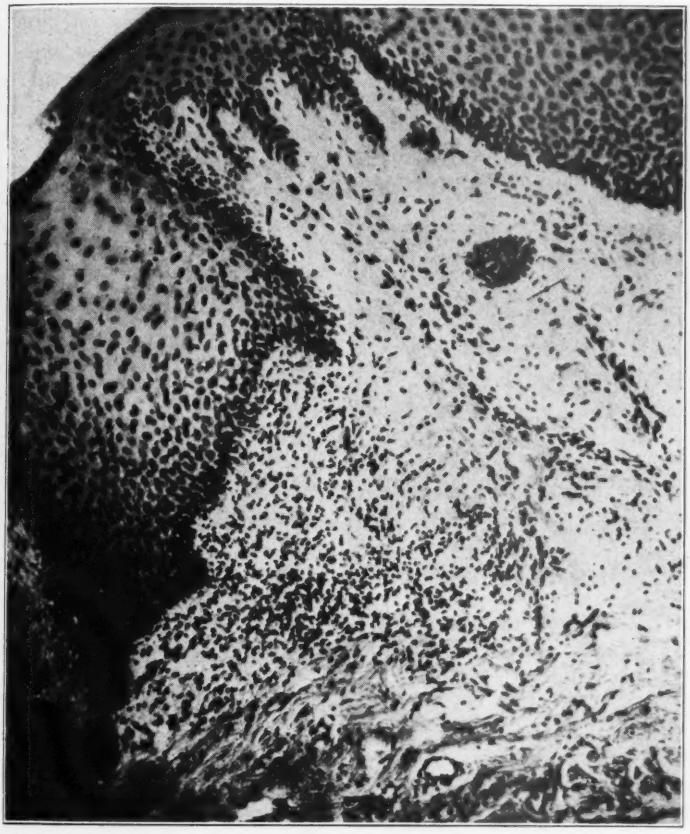

Fig. 40.—Early lymphocytic infiltration subjacent to epithelium in human being.

and unrelated to the subepithelial infiltration.

Figure 22 shows a section cut mesiodistally through the upper right first and second bicuspids (Fig. 15 at *4-5*). Clinical examination of this tissue calculus was observed between the teeth, and there is considerable interproximal wear.

Blood vessels are numerous in the gingival papilla, many of them being of large size. Some are thrombosed, oth-

ers dilated. A thrombosed vessel with disintegrating walls is shown in Figure 24. Extreme indipping of the epithelium may be seen at *a*, Figure 22. The invasion of epithelium along the root at *b* is halted by a strong band of fibers. (Fig. 23, *a*). The center of the crest of the septum is necrotic, owing, doubtless, to the liberation of toxins from the inflammatory process.

The specimen shown in Figures 25 and 26 was selected from a collection

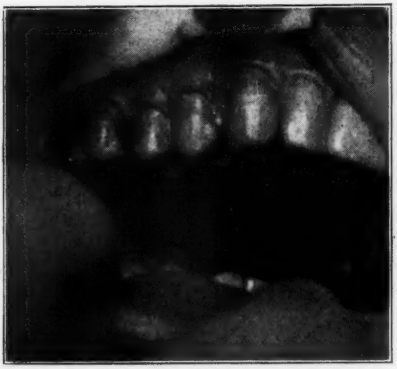

Fig. 41.—Local parodontitis.

of skulls belonging to the University of California. There is no history available. The skull appears to be that of a white man. The deposits of salivary calculus are very extensive. They are stained a deep black.

A characteristic of salivary calculus is well shown in Figure 27, which was photographed in an oblique direction from below the mandible. The tendency of the deposits to overlap the gum is apparent. In a dried specimen such as this, the gums being absent, the cervical edge of the calculus produces a funnel-like effect.

These figures show the close parallelism which exists between the cervical edges of the calculus and the border of the alveolar process. The condition of this margin varies in different regions. At *b*, Figure 25, it forms a thin edge of compact bone in close apposition to the roots of the teeth. Along the line *A A*, Figure 26, it is everted. This condition is common in the site of the posterior teeth of primitive skulls with well-worn teeth. It is probably in large part a phenomenon in response

Fig. 42.—Parodontitis.

to stress which produces such an effect as was shown at *b*, Figure 21.

Tissue from a case in which a considerable incrustation of salivary calculus was present on the buccal side of an upper right first molar is shown in Figure 28. The patient was 24 years of age. The material was obtained by incising the buccal gum in the shape of a rectangle, chiseling through the bone and then removing the tooth and attached fragment. The tip of process stands close to the crevicular edge and to the inflammatory infiltration, yet is apparently in good condition. The indipping of epithelium along the root has been halted by a still vital cemento-

blastic strip at *d* and again by a bundle of fibers at *e*. (A higher magnification of this region is shown in Figure 29.)

The inflammatory process in the gingiva is characterized by hemorrhage, disintergrating leukocytes, transitional and polymorphonuclear, and cellular detritus. The process is much more intense than that shown in the first case.

Figure 30 is from a case in which a large piece of firm salivary calculus

Fig. 43.—Local parodontitis, chemo-irritative, due to smoking.

was removed from the buccal side of an upper first molar. The underlying gum was the color and texture of liver. It was excised and sectioned, and is here shown under high magnification. It is characterized by a lymphocytic exudate. Polymorphonuclear leukocytes may be seen at *b*, Figure 31. Ulceration is apparent at *a*, Figure 30.

Figures 32-35 show the characteristics of clinical cases.

One is tempted to conclude that deposits of salivary calculus are an expression of the factor or factors which contribute toward high systemic resistance. But such an opinion is not justified; for we find deposits of salivary calculus in cases of marked predisposition. We can say that conditions in the mouth may be suitable for these deposits in cases in which there is no predisposition or a high systemic resistance to parodontoclasia. Apropos of this, we have found salivary calculus on the fourth premolars of two coyotes—young animals possessing perfect dentition, teeth otherwise clean, and massive alveolar processes and healthy gums.

Fig. 44.—Local parodontitis, chemo-irritative, due to smoking.

One of these animals furnished the specimen from which histologic sections to be discussed later were prepared.

We do not find "pockets" of any magnitude associated with firm concretions of salivary calculus, even in cases of generalized sulcicalcic or crevicular parodontitis. In fact, measurements with a parodontometer generally reveal about a millimeter of free margin. If care is not taken to avoid pressure with this treatment, the exploration evokes slight hemorrhage.

The somewhat different reactions displayed by the tissues discussed are easily

Fig. 45.—Septal tissue from a 13-year-old boy who died of meningitis and bronchopneumonia. The case showed sordes.

accounted for on the basis of difference in virulence and dominance of micro-organisms involved and difference in the resistance of the host. Variations in the microscopic picture will also be expected to synchronize with changes in the resistance of the individual from time to time.

of the local attacking forces and intervals of successful repair.

Local Chemo-Irritative Parodontitis.—Fermenting or decomposing detritus stagnating about the gingivae is unquestionably capable of producing a gingivitis. If the patient has a systemic predisposition, this may initiate condi-

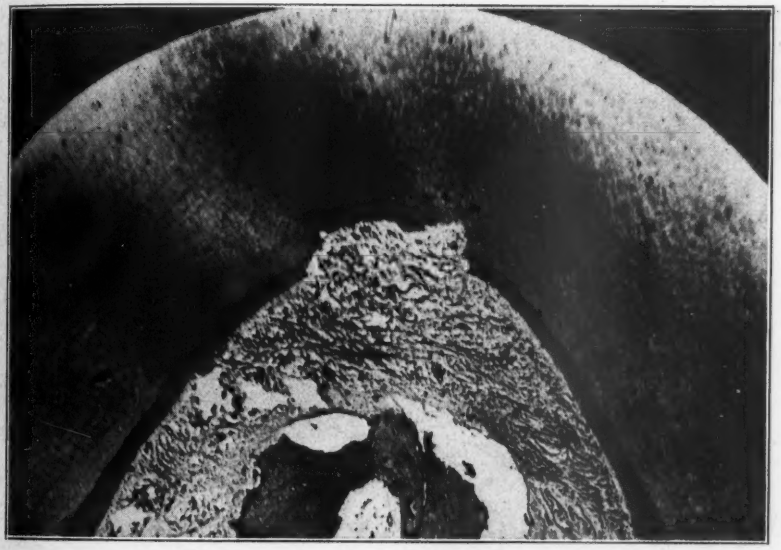

Fig. 46—Erosion in the crotch at the bifurcation of a root of an upper molar in a 13-year-old boy.

It is apparent that salivary calculus is a low grade irritant, and exerts a much less noxious influence than does the soft *materies alba.* In fact, it would seem that this calcified conglomerate calls out a tissue reaction, possibly of the nature of repeated active immunities, which protects against more serious damage.

The excellent form and texture of the receded alveolar margin shown in Figure 25 also postulates repeated rebuff

tions capable of bringing about the loss of the teeth. Gingivitis associated with poor hygiene is common in children and frequently does not result in injury of any consequence, probably because the growth potential offsets such degenerative processes.

Figure 36 shows a section of lingual gum crescent from a robust girl, aged 14 years. This tissue was obtained in a search for control material. It is rare indeed to find a piece of normal

gum tissue, excision of which is justified. It would seem that the most favorable age would be the period subsequent to the hyperemic conditions attendant on eruption and precedent to the almost universal incidence of gingivitis during the later adolescence and in adult life. The occasion for excision of tissue in this case was the necessity for extracting the lower right first molar, which presented advanced caries with pulp involvment. The mesial interdental papilla, which was hyperemic, was cut away, and

Fig. 47.—Parodontitis in a rachitic child, aged 3 years. (Case 1.) Recessions, detachments and swollen gingivae may be noted.

will be discussed shortly. The lingual gum crescent appeared to be free from inflammation and quite normal. The lingual wall of the tooth was intact. It will be seen (Fig. 36) that, doubtless as a result of imperfect hygiene,[20] a lymphocytic infiltration had occurred, adjacent to the external epithelium.

A section of the hyperemic papilla is shown in Figure 37. There are myriads of lymphocytes, many plasma cells and considerable hemorrhage. The hygiene about the papilla was poor.

Materies alba contains stagnating food débris, epithelial cells, mucin and other salivary constituents, serum and micro-organisms.

Fermentation of carbohydrates by bacteria produces acids, carbon dioxid, alcohol, hydrogen, etc. Putrefaction of

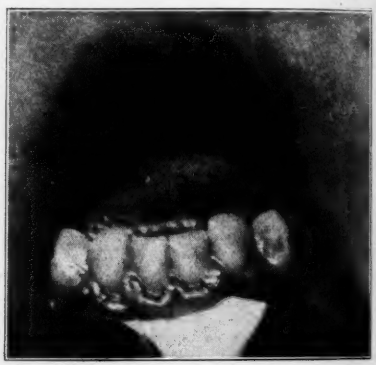

Fig. 48.—Parodontitis in a rachitic child, aged 3 years (Case 2). Recessions, detachments and swollen gingivae may be noted.

protein will result in the production of amino-acids, fatty acids, ammonia and various more or less toxic amins. These end products, together with exotoxins and endotoxins from the bacteria, are irritants capable of opening up the epithelial barriers of the gingivae to invasion by micro-organisms.

An interesting specimen of buccal gum from a sheep is shown in Figure 39. There is no round cell infiltration in this tissue. The striking resemblance of this area to one from human tissue figured by Beckwith, Simonton

20. Even in mouths receiving conscientious care from the patient, hygiene becomes progressively more imperfect in the region distal to the first molar on buccal surfaces and distal to the cuspid on lingual surfaces, and, of course, on the proximal surfaces of the molar teeth.

and Williams[21] justifies reproducing the illustration from their article. Figure 39 shows shows sheep tissue, Figure 40, human. In the latter case the inflammatory reaction is marked.

Considerable débris lodges about the bases of the fluted columnar crowns of the cheek teeth of the sheep, but it is apparently innocuous. Clinical characters of the chemo-irritative type are shown in Figures 41-44.

This stagnation of food débris, which gives rise to inflammation and gingivi-

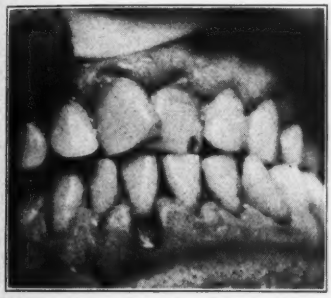

Fig. 49.—Injury due in part to injudicious brushing of the parodontitic tissue.

tis, is a matter of grave concern. I have repeatedly examined mouths in cases of systemic predisposition in which the patient has been unusually attentive to the hygiene of his mouth. The findings are always the same. The presence and degree of inflammatory process is dependent on the amount of the débris. In the typical case, from the central incisor to the first molar, the gingivae of the vestibular surfaces are normal, with surfaces clean. The gingiva of the second and third molars are progressively more inflammatory and the hygiene is progressively poorer. The

Fig. 50.—Injury due in part to injudicious brushing of the parodontitic tissues.

hygiene of the lingual surfaces is less effective distally to the first bicuspids and the gum margins are correspondingly affected. The proximal surfaces of all the posterior teeth are habitually unclean; those of the second and third

Fig. 51.—Stillman cleft at the labial margin of the lower right cuspid, due, in part, to injudicious brushing.

molars as a rule markedly so. Dr. Fleming[22] has shown, in a study of

21. Beckwith, T. D., Simonton, F. V., and Williams, Adrienne: A Histologic Study of the Gum in Pyorrhea, J.A.D.A., V. 12, of the Gum in Pyorrhea, J.A.D.A., 12: 129-153 (Feb.) 1925.

22. Fleming, W. C.: Localization of Parodontoclasia, Dent. Cosmos (June) 1926.

forty-five cases of parodontoclasia, that the detachment on the proximal surfaces exceeds that on the facial and atrial (lingual and palatine) surfaces combined. He has shown that the mesial surfaces of the third molars are more involved than the distal; they are less clean; also that the distal surfaces of the first molars are more affected than the mesial: the former are less clean than the latter (in spite of the broader interproximal space) because of a wider contact and greater inaccessibility. Such a universal tendency to stagnation of débris about the teeth cannot be regarded as normal. It would seem acceptable *a priori* to assume that Nature intended mouths to be self-cleansing. There is good clinical evidence that such is the case. For example, everyone is familiar with sordes in the mouths of the sick. These mouths become clean when the patient regains health.

Fig. 52.—Stillman cleft, upper left lateral incisor, due in part to brushing across the mass of gum labial to the lingually displaced cuspid.

The following case is instructive from a number of standpoints.

I was consulted in reference to the dental condition of a hospitalized boy. The physicians had diagnosed "pyorrhea." Examination of the mouth showed a generalized sordes and gingivitis. Actual detachments of 2 mm. existed on some of the anterior teeth. The condition generally would be characterized as gingivitis due to an unhygienic condition of the mouth rather than to pyorrhea. This boy was very ill from a number of grave disorders and succumbed three months after admission to the hospital. The following data show the conditions:

P. T., a Russian boy, aged 13 years, whose condition on admission to hospital was diagnosed as: brain tumor; adenoma sebaceum; multiple neurofibromatosis (von Recklinghausen's disease), and pyorrhea, underwent operation, Feb. 2, 1925, as follows: a two-stage right parietal osteoplastic flap was made, with transcortical extirpation of a third ventricle tumor.

February 26, the patient developed meningitis and diffuse bronchopneumonia, and April 7, he died.

Fig. 53.—Local parodontitis, traumo-irritative. Preservation of the septal bone is excellent in spite of faulty fillings.

The necropsy report showed: (1) ependymal glioma extending into the right lateral ventricle and almost completely filling it; (2) internal hydrocephalus of both lateral ventricles; (3) obliteration of the foramen of Monroe; (4) granular ependymitis of the fourth ventricle; (5) bilateral organizing bronchopneumonia; (6) dilation of the heart; (7) bronchiectasis (slight); (8) hemangiofibroma of kidney; (9) pedunculated fibromas of the skin; (10) adenoma sebaceum of the skin; (11) adenoma of the prostate; (12) cyst of the spleen (2 cm. in diameter); (13) emaciation; (14) healed wound of cranium.

A section prepared from dental tissue removed postmortem is shown in Figure 45.

There is some round cell infiltration near the tip of the gingival papilla. The epitheliocemental attachments are perfect. It will be

observed that the insertion of fibers takes place to the very extremity of the cementum; also that there are few cells in this area.

There is a margin of process at *a* where osteoclastic absorption has taken place, but the retrograde change had ceased and repair was taking place, fibers being built anew into the bone.

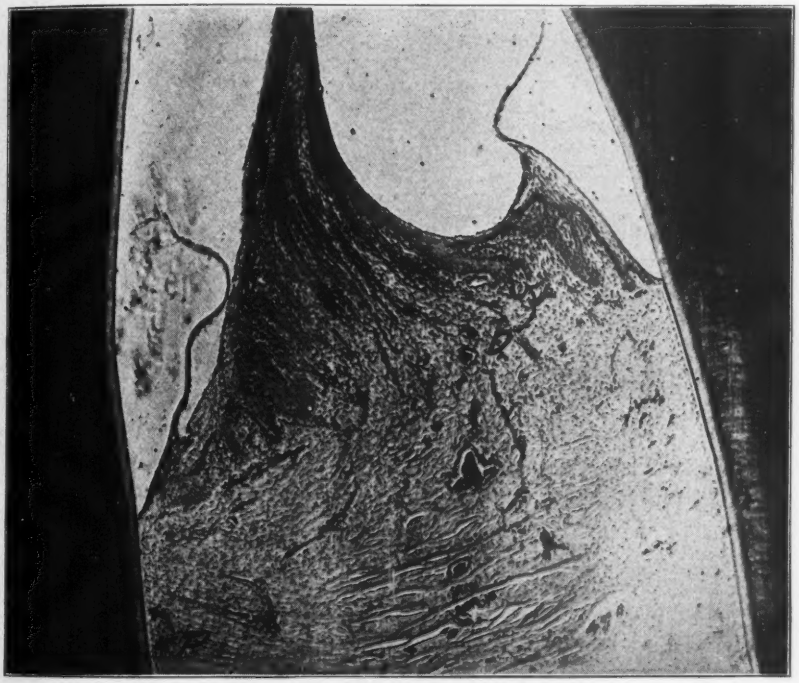

Fig. 54.—Septal tissue from young coyote. The perfection of the epitheliocemental attachment is evident.

The septal bone is good, architecturally and biologically. It is dominantly cancellous rather than haversian. There is considerable subperiosteal bone and some actively growing bone.

In Figure 46 may be seen an erosion in the cementum and dentin of the crotch at the bifurcation of the roots of an upper molar from this case. Repair is in progress.

The only marked departure from normalcy is in the pulp. It is comparatively cellular and has undergone fibrous degeneration, and the odontoblasts have practically disappeared.

In spite of the grave symptoms which exisited in this case, the parodontal tissues were essentially normal. This conforms with a feeling that I have had that the attempt to relate parodontoclasia to any and all systemic disease has been an unwarranted generalization. It is probable that certain systemic diseases, such as diabetes, may lower the barriers to the exciting factors of parodontoclasia, but there is strong evidence that the systemic predisposition to this

disease is more specific than has been generally appreciated by the advocates of the "systemic hypotheses."

The following cases are instructive:

I was consulted in regard to the dental conditions of rachitic twins, 3 years of age. (Figs. 47 and 48.) During the acute manifestations of the condition, the mouths were filthy, teeth rapidly disintegrating, gums re-

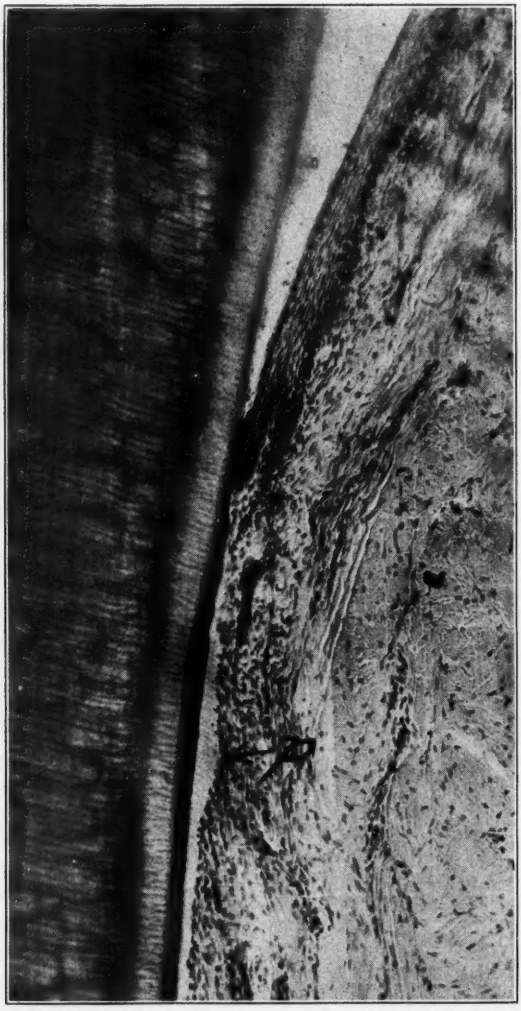

Fig. 55.—Tissue from a normal adult domestic dog. There is indipping of the epithelium along the cementum. The precementum at *P* is to be noted.

ceded and inflamed. Later, under cod-liver oil therapy, the children were remarkably improved. With no effort at oral hygiene on the part of the mother, the mouths of both became clean, the disintegration of the teeth ceased and the inflammation subsided.

It is my conviction that the improved systemic condition was the controlling factor in determining the change in cleanliness of these mouths. This systemic influence must have acted

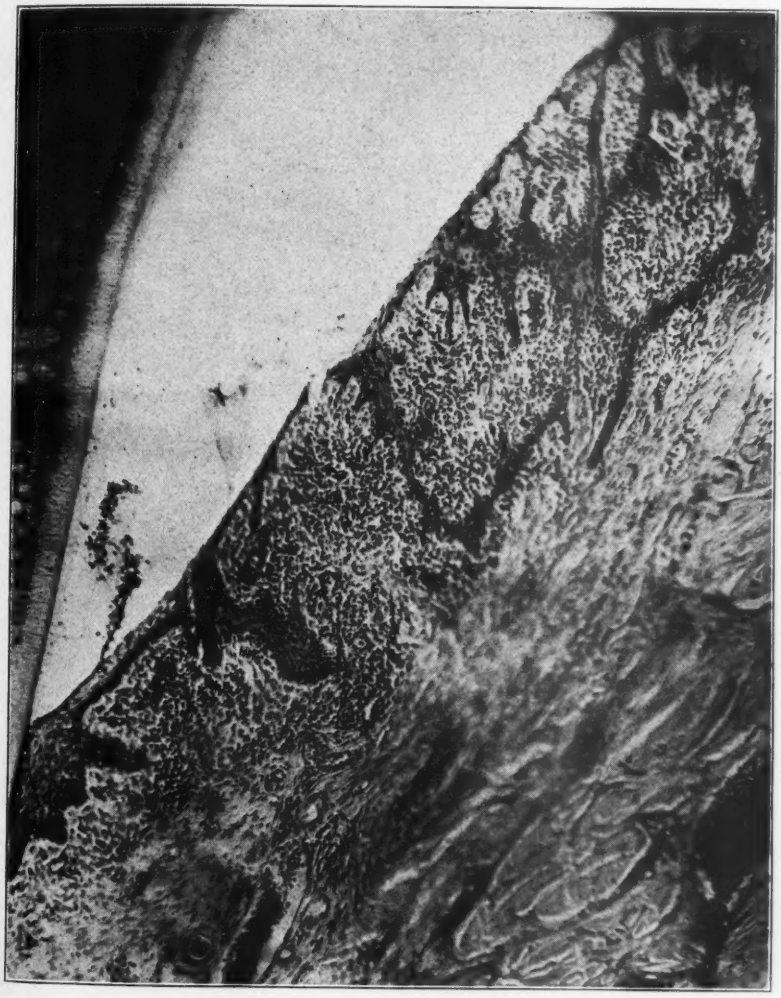

Fig. 56.—Ingrowths of epithelium which appear to be walling off the inflammatory process in a normal adult domestic dog.

by way of the saliva. Whether an alteration in constitution of the saliva in mucin or metabolites or salts or diastase; or in hydrogen ion concentration affecting the balance or virulence of the micro-organic flora, was the local agency remains for future research to reveal.

It is held by some that the soft, pappy nature of many of our artificially prepared foods is an important factor. This is doubtless true.

Local Traumato-Irritative Parodontitis.—This condition may be brought about in a number of ways. It may result from faulty use of the toothbrush. Various forms of parodontitis are aggravated by injudicious use of the toothbrush on inflamed gums (Figs. 49-

Fig. 57.—Indipping epithelium halted by intact fibers at *a*, in a normal adult domestic dog. The inflammatory process is somewhat in advance of the downgrowth of epithelium.

Fig. 58.—The splitting of the indipping epithelium and proliferation of epithelial whorls *b-b-b* may be noted. Lymphocytes may be seen at *a*. The tissue was taken from a normal adult domestic dog.

52). Faulty dentistry is also responsible and likewise initiates infection in many of the systemic cases. Patients differ markedly in their toleration of trauma; for example, some resent a weak or open contact, whereas others are quite unconscious of such a condition.

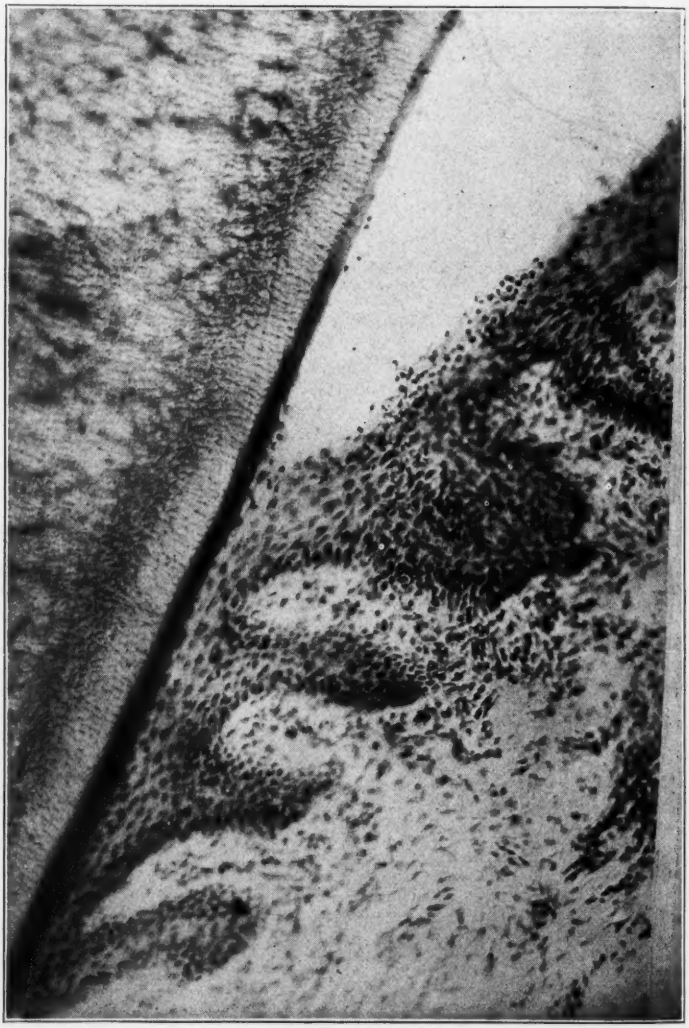

Fig. 59.—The splitting of indipping epithelium in a normal adult domestic dog may be noted.

An interesting case in which the effects of local irritation were strictly localized by a magnificient system resist-

The patient was 42 years of age. The amalgam fillings had been in place from a decade to a decade and a half.

Fig. 60.—Nodular masses of precementum *b* and *c* may be noted, as well as strips of precementum at *e* and *f*. The epithelium is indipping and has engulfed a whorl at *a*. The tissue is from a normal adult domestic dog.

ance is shown in Figure 53. The faults in the restorative work are obvious.

(There is reason to believe that the metals of fillings and crowns exercise

a germicidal influence which helps to check infectious processes; nevertheless, the same conditions in other patients without the systemic resistance of this case would evoke grave sequelae.)

whether local, systemic or mixed. But there are certain variations which give rise to clinical symptoms that are useful in prognosticating the gravity of the involvement. In all cases, the essential

Fig. 61.—Parodontitis; parodontal osteomyelitis; osteitis, and pericementitis. There is much inflammation in the gingival papilla and a moderate indipping of epithelium along the cementum. Invasion of the bone marrow with some fibrosis has occurred. There are slight inflammatory processes about the pericemental blood vessels.

Systemic Parodontitis.—The sequence of events, as far as the histopathology is concerned, is along the same general lines in all forms of parodontitis, etiologic factor is the lowering of the resistance of the soft tissues, permitting the resident micro-organisms to invade. The reaction to this infection will de-

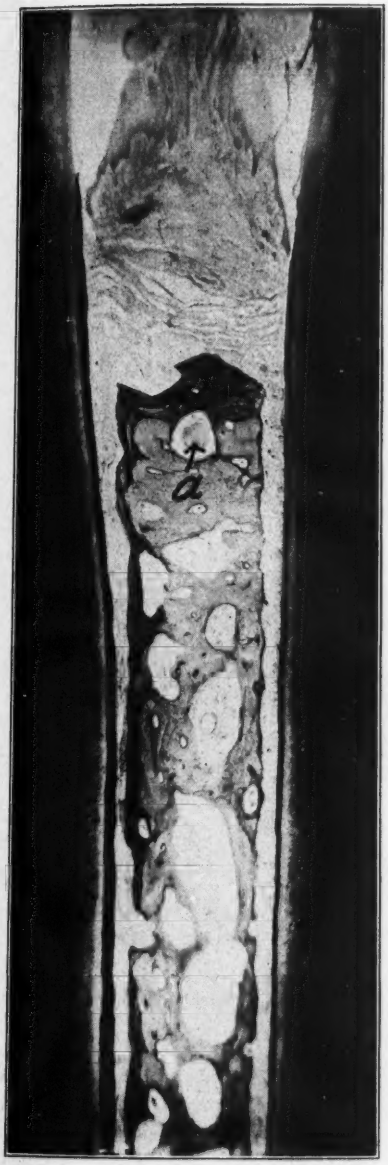

Fig. 62.—Gingivitis and crevicular paradontitis; early stage, *a*, cross-section of epithelial papilla that has grown down into marrow space.

pend on the severity of the local exciting factors; the relative dominance and virulence of the flora of the mouth; the accidental ingress from other mouths of similar species to those existing in the mouth of the case being considered; the accidental ingress of transient pathogens; the ability of the host to elaborate antibodies; the nature of the cellular defense, (leukocytes, clasmatocytes, etc.); and the intensity of the endogenous etiologic factor. The artificial care of the mouth and the function will also be factors.

The steps in the progress of the condition are: (1) an infiltration of the gingiva; (2) stripping of the pericementum; (3) extension of the epithelium along the side of the root, or rupture at the cemento-epithelial junction, usually with acute infection and purulent exudate; (4) osteomyelitis and resorption of the alveolar process.

Infiltration of the Gingiva.—This has already been discussed. It may be said briefly that the epithelial barrier of the gingival mucosa may be opened to the invasion of micro-organisms as a result of some mechanical or chemical injury. The portal of entry may be on the external surface of the gingiva, or more frequently on the sulcular surface. The invading micro-organisms are usually such as are resident in the mouth. Transients, however, gain ingress. If these be virulent, an acute infection may follow.[23] The tissue reactions, cytologic and serologic, may quickly and completely overcome the microbes, or if the resistance is inadequate, a subacute or chronic condition

23. Hall, Ivan C.: Bacterial Factors in Pyorrhea Alveolaris. III. The Isolation of B. Tetani, B. Welchii and Other Sporulating Anaerobes from Human Saliva, J. Infec. Dis., 37: 87-92 (July) 1925.

may result. The typical picture of the gingivitis is that of round-cell infiltration, a low grade subacute infection.

Stripping of the Pericementum from the Root.—Figure 54 shows tissue from a young coyote. The perfection of the cemento-epithelial junction is evident. Under higher magnification, it will be seen that strong bundles of fiber are attached to the cementum up to its points of termination. Apically from this point, there is much fiber and relatively few cementoblasts. At *p* is a layer of precementum. The bloodvessels in the papillae are numerous and large. An interesting epithelial papilla is shown at *B*. It has apparently grown in response to toxins liberated *in situ* from the perivascular channels. Along the center, it is undergoing hydropic degeneration. Evidently, the infections which may result from injuries, or may

Fig. 63.—Gingivitis and parodontal osteomyelitis; early stage. The tissue is from an Indian, aged 27 years. Indipping of epithelium, subepithelial infiltration and invasion of marrow may be noted.

Fig. 64—Gingivitis and parodontal osteomyelitis; early stage. The tissue is from an Indian, aged 27 years.

invade through the epithelium, are effectively and rapidly combated.

Fig. 65.—Parodontitis, crevicular, in man, aged 42, in good health.

Figures 55-60 show various characters of downgrowth of epithelium in apparently normal adult domestic dogs.

The invasion of epithelium cannot occur until the fibers are stripped or the cementoblastic layer is lysed. It would seem that, where new deposition of gingival cementum is occurring and cementoblasts are numerous, toxins may more readily sever the connection of

Fig. 66.—Parodontitis, cicvicular, showing the effect of pericementitis. There is scar fiber parallel to the root.

pericementum and cementum, but where strong fibers are in position and cementoblasts few or absent (resting phase), a stronger toxic influence is necessary to strip these fibers.

Invasion of inflammatory process

Fig. 67.—Tissue from a tuberculous man, aged 35, having gingivitis and parodontal osteitis, condensing. Erosion of the crest at *a* and penetration at *b* are evident.

Fig. 68.—Condensing osteitis; region *C*, Figure 67.

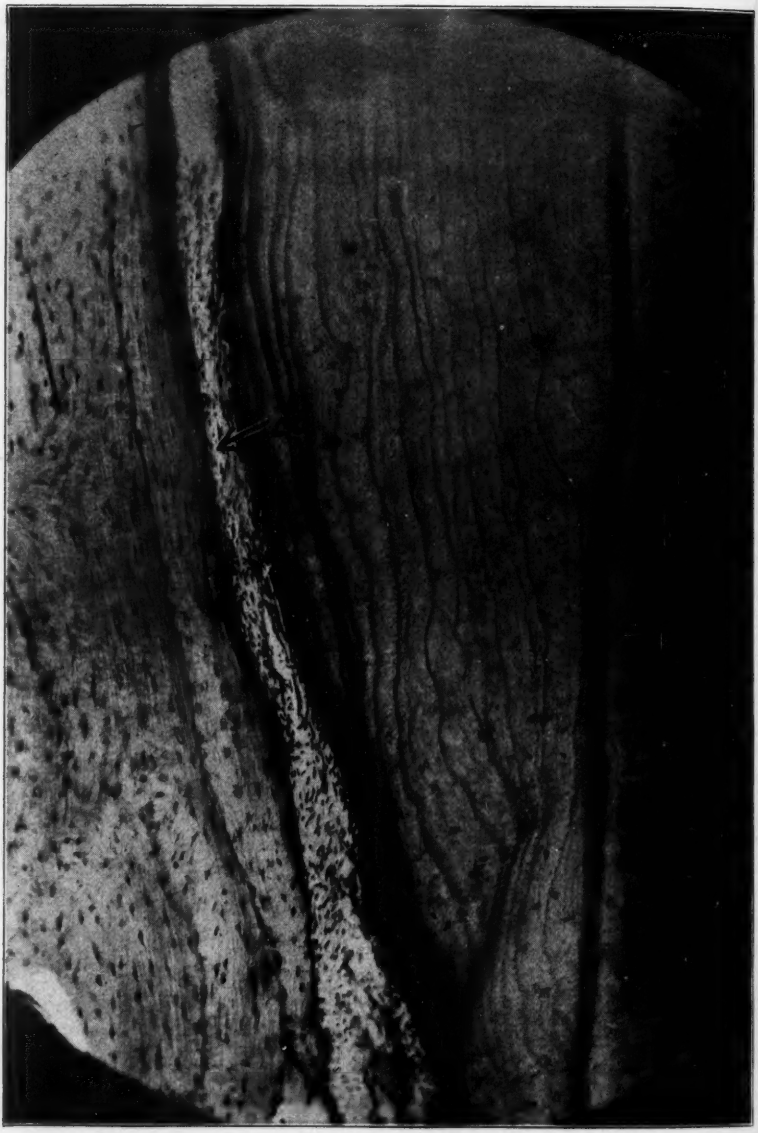

Fig. 69.—Marked hypercementosis and thinning of the pericementum, in a tuberculous man, aged 35. Evidences of fibrous degeneration may be noted at *a*.

Fig. 70.—Tissue from a tuberculous man, aged 35. Fibrous ankylosis is evident at *b*.

and solution of fibrous masses laterally to the cementum takes place, but the indipping of epithelium along the root

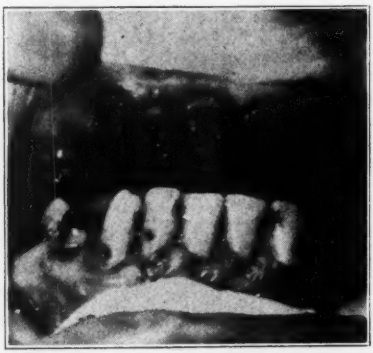

Fig. 71.—Parodontitis, sulcicalcic.

lags behind until the cementum is stripped.

Extension of Epithelium Along the Side of the Root.—The indipping epithelium, as well shown by Box, splits

Fig. 72.—Parodontitis, sulcicalcic; biopsy specimen from which sections were prepared.

as a result of degeneration of the inner cells. This splitting leads to the formation of a crevice. The process may proceed indefinitely until the tooth is lost. Calculus will usually be laid down within these crevices. Hatton[24] has shown how the presence of inflammatory toxins are capable of stimulating the proliferation of epithelium. If the pericemental attachment to the root is perfect, the epithelium must grow in other directions, but if the root has been stripped through lysing of the fibers of the pericementum, it may invade until stopped by intact fibrous attachment. It is certain that epithelium cannot force its way past the latter.

Fig. 73.—Tissue shown in Figure 68. The cloven septum at *a* may be noted.

Osteomyelitis.—In advanced conditions, the bone marrow is invaded by micro-organisms. Infiltration of lymphocytes and plasma cells follows; the fat gives place to fibrous tissue, and the bone is very slowly destroyed. Infection is also transmitted along the perciementum by the lymphatics. At intervals, perivascular infiltration and fibrosis may be seen, resembling the rarefying pericementitis fibrosa of Box. The epithelial rests nearest the toxic

24. Hatton, E. H.: Microscopic Studies of Diseased Peridental Tissues, J.A.M.A., 71: 1549-1552 (Nov. 9) 1918.

areas have undergone some proliferation.

Figure 61 shows the upper left central and lateral incisors of a Mexican, aged 26 years. Following is a brief statement from the medical record:

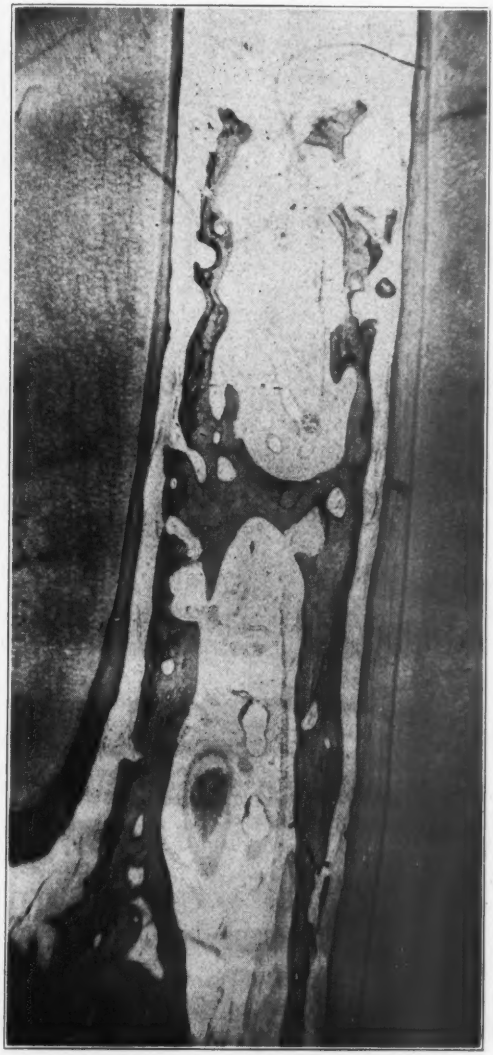

Fig. 74.—Parodontitis, sulcicalcic.

Fig. 75.—Parodontitis, sulcicalcic, *C* is in the direction of the crown. Ulceration of the gingival papilla is present. Masses of Leptothrix are shown at *B*.

The patient's father is living and in good health at the age of 60. The mother is dead from an unknown cause. Two brothers, aged 11 and 9 are in good health, as are also two sisters, aged 14 and 9. The wife, aged 23, has good health. The patient did not know whether any members of his family had suffered from alcoholism, cancer, tuberculosis or insanity. He had lived in Texas since infancy. His occupation was that of a shoemaker and machinist. He had had the following diseases: smallpox, in infancy, gonorrhea (1917), syphilis (1918) and chancre (1918). There had been no surgical operations or accidents. He was admitted to the hospital, April 6, 1925, and died of pulmonary tuberculosis, May 2, 1925.

The clinical examination revealed the following: The labial gums were

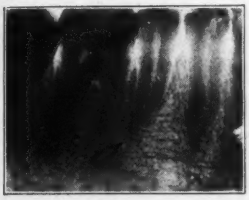

Fig. 76.—An illusion which makes the septum at *a* appear to be cloven, due to superimposing of root on septum. Compare Figure 73.

not receded; in fact, they seemed somewhat redundant. There was some *materies alba*. Pockets, if any, were slight. Apparently, there was no calculus. Stippling of the gum was still present. There was a slight notch in the crescent of gum labially to the central incisor. On stripping away this gum, a corresponding notch was observed on the margin of the process.

The gingival papilla was markedly infiltrated. The epithelium had crept along the roots until stopped by bands of fiber. At *a*, the infiltration had penetrated in advance of the epithelium and had lysed fibers externally to the cementum. Invasion of the bone marrow had occurred at *c* and some fibrosis developed. Tissue resembling the "new" tissue of Box can be seen at *b-b*. This again is perivascular. The septal bone, except at the center of the crest, was good, and, although cancellous, appeared rugged.

Tissue from the same case from between the lower left cuspid and first bicuspid is shown in Figure 62. The septum of process is much more compact here (less transformation of haversian into cancellous bone). The papilla is again engorged with lymphocytes. There is some invasion of the bone

Fig. 77.—Tissue shown in Figure 76 from a different angle of exposure. The septum at *a* appears quite normal.

marrow. The pericementum is generally fairly normal.

Tissue from the upper left bicuspids and parodontia removed postmortem from an Indian, aged 27 years, in good health preceding death by violence, is shown in Figure 63.

A brief statement of the case follows:

The patient was unmarried. He worked as a lumberman. His father and mother died of tuberculosis. One brother and one sister died from tuberculosis at the ages of 22 and 23. The patient had had pneumonia (1908), gonorrhea (1920), typhoid fever (1918) and smallpox (1918). He had had no accidents or operations. He used alcohol and tobacco. The Wassermann reaction was

negative, and physical condition good. He died from hemorrhage caused by a stab wound, April 30, 1925.

The clinical examination showed some *materies alba*. Pockets, if any, were slight. A small flake of calculus was detected under the buccal gingiva of the first bicuspid. The lingual gingiva of the first bicuspid was apparently normal; that of the second bicuspid was blunted and somewhat receded.

There is considerable infiltration subjacent to the sulcular epithelium at *a* (Figure 63). The epithelium may be seen indipping along the side of the root at *b*. Its snout is in apposition with a bundle of fibers attached in the cementum. It has engulfed an epithelial whorl. The inflammatory process is in advance of the epithelial proliferation. In the course of this inflammatory process, a number of epithelial whorls may be seen, some of which appear to be proliferating. There are also some free lying epithelial cells. The presence of intact fibrous tissue affords a structural resistance to the encroachment of the epithelium, so that the latter tends to follow the directional influence of the fibrous bundles. The fibers are disrupted as the process advances, partly through lysis and partly as a result of pressure.

Throughout the connective tissue of the gingival papilla are regions of round-cell infiltration lying between the fibrous bundles.

There is some infiltration into the bone marrow proceeding longitudinally through the center of the septum. The alveolar process is cancellous, with large marrow spaces. Erosions may be seen along the parietal surfaces of the septum and about the margins of the marrow spaces. Here and there, remnants of subperiosteal bone show halisteresis. The pericementum, in general, is good.

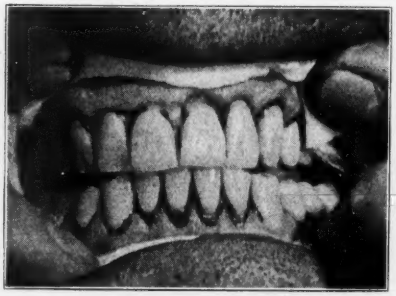

Fig. 78.—Sulcicalcic parodontoclasia. The immunity of the teeth to caries may be noted.

Fig. 79.—Sulcicalcic parodontoclasia. The exposed splinter of serumal calculus on the buccal side of the bicuspid may be noted.

Figure 64 shows the lower central incisors and parodontia of the same case. Here may be seen the first stages in the involvement of the process and the bone marrow. Resorption of the center of the crest of the process is apparent at *a*. Resorption at *b* has cut through the bone and invasion of the marrow has begun.

Tissue obtained at biopsy from a man, aged 42, in good health, is shown in Figure 65.

In this condition, which was an advanced one, some infiltration of the marrow has occurred, but the pericementum was most affected. The penetration is selectively perivascular, accompanied by fibrosis. The surface epithelium appears to be exhausted. The epithelial whorls are markedly proliferative. Figure 66 shows the condition of the pericementum at about the center of the length of the root.

Tissue removed postmortem from a tuberculous Englishman, aged 35, is shown in Figures 67-70.

Fig. 80.—Sulcicalcic parodontoclasia. The divided interdental papilla, lifted to the labial with floss, may be noted.

In Figure 67, the indipping of epithelium along the roots is not far advanced. As yet, no crevice has been formed. The round-cell infiltration is marked, and has penetrated to the bone. At *a* is an erosion of the crest of the septum, which is definitely related to an extension of the inflammatory process between the fibers and by way of the perivascular channels. The bone of the septum is markedly compact—dominantly haversian. Many of the haversian systems have been calcified practically solid. The roots of the teeth show hypercementosis. At *a*, Figure 69, the pericementum has become thinned through deposits of cementum on one side and of subperiosteal bone on the other. It has undergone fibrous degeneration and pseudo-ankylosis is about to take place. Here and there along the lateral margins of the septum are areas of lacunar resorption, doubtless due to infection.

Sulcicalcic Parodontitis.—A case in which large deposits of serumal calculus characterized the clinical picture is shown in Figure 71. Two lower incisors, excised at biopsy, are shown in Figure 72. The patient was 32 years of age.

Fig. 81. — Sulcicalcic parodontoclasia. Paracemental abscess at *a*, also pus expressed from the abscess may be noted.

A radiogram of this piece of tissue is shown in Figure 73, and a low power photomicrograph in Figure 74. The condition of the teeth themselves will be discussed in another connection. The calculus was abundant, consisting of serumal deposits upon which were superimposed salivary ones.

The gingival papilla (Fig. 75) shows an ulcerating tip; the neck is constricted, and on either side are heavy deposits of calculus, against which the necrotic tissue of the papilla is being calcified. The indipping of the epithe-

lium along the roots is not especially marked, considering the degree of involvement of the tissues generally. The epithelium, in fact, appears to have been exhausted by the toxic conditions, and shows a tendency to give way *in toto*. The invasion of the bone marrow is extreme. With the exception of one horizontal trabeculum, it has been cloven completely down the center. This condition may be noted in the radiogram (Fig. 73).[25]

The marrow fat has practically disappeared and given place to fibrous tissue. The pericementum is the least affected of the parodontal tissues in this case. Clinical characters of sulcicalcic parodontoclasia appear in Figures 78-81.

COMMENT

Retrograde changes in the parodontal tissues occur as a result of various admixtures of local and exciting factors. The involvement varies directly with the local factors and inversely as the resistance.

The local exciting factors may be sufficiently intense to produce grave injury, however high the resistance. On the other hand, they may be such as are inconsequential unless the resistance is low.

It is convenient and useful to consider those cases in which the local exciting factors are dominant, as a group under the designation "local parodontoclasia." The local exciting factors have been given exhaustive study by the dentists of this country in particular. If full application is made of the knowledge available in both detecting and correcting the local factors, we have little to apprehend as long as the resistance is unimpaired.

Systemic parodontoclasia may be understood to refer to those conditions in which the resistance is low. In such cases, the local exciting factors may be of varying degrees of prominence or may be inconsequential or absent.

The accumulated evidence, both clinical and microscopic, justifies another division into two great types: the noninflammatory and the inflammatory.

In the noninflammatory type (parodontosis), the systemic factors are of far greater consequence than the local. The local factors are of far less relative importance than in parodontitis. Parodontosis may progress rapidly. The essential retrograde change is that of halisteresis of the alveolar process, beginning at the crests of the septums and affecting first the subperiosteal bone. Gottlieb believes that this condition is of systemic origin and not due to systemic disease. Our results in the experimental animal relate such changes in the dog to nutrition; specifically to disturbance of the acid-base balance.

Contrary to the opinion of certain investigators, all parodontoclasia does not begin as alveolar atrophy. A number of cases have been presented in which the inflammatory process dominates the condition and the bone is only secondarily involved. The local and systemic factors are intimately blended in the parodontitis. The sequence of the conditions is as follows: the invasion of micro-organisms into the gingivae; stripping of the cementum; indipping of epithelium along the roots of the teeth; erosion of the bone;

25. Figure 76 shows a condition that might be mistaken for the radiogram of a cloven septum. The tissue was perfectly normal, however, as indicated by Figure 77. Such observations illustrate the necessity for great care in the interpretation of radiograms.

penetration of the inflammatory process through the bone into the marrow, then extension in the marrow along the course of the blood vessels; fibrous metaplasia of the marrow, and secondary erosions of the bone. There occur also longitudinal perivascular extensions of this inflammatory process through the pericementum, with localized processes characterized by round-cell infiltrations, replacement of fibrous bundles with lighter, indifferently disposed fibrous masses, and lacunar resorption of the margins of the septum with replacement by loose fibrous tissues. Involvement of the cementum and dentin occur only in very late stages of parodontitis. (This may occur early in parodontosis.)

Confirmatory of the evidence submitted above to the effect that alveolar atrophy is nutritional in origin and not connected with systemic disease (compare Gottlieb) is the material shown from a series of postmortems and biopsies. The bone was found to be architecturally and biologically good (except as involved secondarily by advanced inflammatory cases) in tissue from a healthy American Indian, a tuberculous Mexican, a tuberculous Englishman, an aged and syphilitic Chinaman and a very sick boy of 13 years.

Systemic diseases may lower the resistance of the soft tissues; but sweeping generalizations to this effect are not justified. This is evidenced by the fact that persons suffering from systemic diseases may be free from parodontitis, and on the other hand, persons apparently in perfect health may suffer from it.

Filth as a factor in parodontitis is unquestionably important. It is contended that a foul mouth is essentially an expression of some systemic fault. There is much reason to believe that the balance and relative virulence of the micro-organic flora of the mouth are controlled in part through the system, by the saliva. The pasty nature of our civilized diet will also be a factor in providing easily utilizable and convenient pabulum.

The causes of parodontosis are apparently different from, and may be in part antagonistic to, those of parodontitis.

Present evidence suggests that the underlying predisposing cause of parodontitis may be found in some type of faulty nutrition, possibly related to acidosis and avitaminosis. Endocrine conditions may also be of importance.

DISCUSSION

R. W. Bunting, Ann Arbor, Mich.: The paper presented by Dr. Simonton is a comprehensive survey of the various etiologic factors involved in pyorrhea. The nomenclature which he has employed is new, and largely original, but it is well founded and may eventually be adopted generally to denote the various phases of those conditions which have so commonly been known as pyorrhea alveolaris. From the point of view here presented, it becomes evident that peridental diseases are not uniform in their etiology nor in the course of their pathologic disturbances. In certain types of cases, systemic, metabolic or dietetic factors predominate, while in others local disturbances are most prominent. Each may be apparent to the trained observer by the clinical courses which they pursue. The question may well be raised as to whether pyorrhea ever occurs without a systemic factor of lowered resistance. As Dr. Simonton has said, severe local stresses may be present in the mouth to injure, chronically, the peridental tissues, but if the resistance is high, there may be no deep pyorrheal involvement. It may be said, then, that, in every case in which the local factors predominate, they are associated with and their specific effects made possible by some form of lowered tissue resistance. As Dr. Simonton has said, many of the underlying systemic factors are beyond the direct control

of the dentist, but it must be remembered that, in the treatment of these peridental diseases, not only are the local factors decreased or eliminated, but also the local nutritive and resistive functions of the peridental tissues are exalted; which later often serves to bring these tissues back to normal or near normal health and vitality in spite of existing general depression. It is probable that, in our present lack of knowledge as to the proper handling of underlying metabolic and nutritional faults, the success of our present-day methods of treating the disease are largely due to the increase of local tissue resistance and vital activity. Dr. Simonton alludes to those cases in which the hygiene of the mouth is persistently bad and, after periodic cleansing, there is a tendency to repeated accumulations of sordes and *materia alba*, with accompanying high degrees of fermentation. In our study of dental caries, we have found that, in those susceptible cases, the predominating bacteria in these masses are invariably *B. acidophilus*, but in non-carious individuals, having a marked tendency to pyorrhea, proteolytic organisms prevail. The determination of the type of bacterial overgrowth which predominates in each individual case unquestionably is dependent on the general metabolism as expressed in the type of salivary secretions, in that, in certain instances, overgrowths of aciduric organisms in other proteolytic types are favored. We have noted that, in the use of antiseptic dyes over a period of several consecutive days, a distinct depression of an existing overgrowth may be obtained in many such cases, and, subsequently, a new type of bacterial flora is established, which makes for a permanent improvement in oral hygiene. This applies to both forms of bacterial overgrowth in the mouth and acts as a distinct preventive measure in the treatment and control of both forms of disease. We congratulate Dr. Simonton on the thorough-going manner in which he and his associates are attacking the problem of peridental disease, and we are assured that their efforts will result in a marked advancement of our knowleldge of this phase of dental pathology.

Edward H. Hatton, Chicago, Ill.: The paper by Dr. Simonton covers a great deal of ground. Since he admits that, in part at least, the etiology is as yet unknown, a classification on any other basis than the pathologic has a very limited significance. There should be no distinction of value between a classification based on gross pathology and one arrived at from the histologic changes, and until the etiology is clearly understood, it would seem that classification should be based on pathology. Certainly it would seem wise, until we know more about the whole subject, to keep our various concepts as simple as possible, and to beware of undue elaboration. There seems to be a tendency in this paper to focus the attention on parts of the tooth and its investing tissues other than the cementum, and that, with one notable exception, seems to be characteristic of the present day school of investigators. Perhaps I am unduly influenced by the opinions and observations of two men, namely, G. V. Black and Bernhard Gottlieb, and if I have truly understood them, I think that both believe that in the peculiarities of the cementum and its reaction to local and systemic changes is to be found the way to the solution of the pyorrhea problem. Such a concept has simplicity and conforms to Gottleib's observation that not a single exception has been found to the rule that every case of pyorrhea has been cured by the extraction of the tooth involved. It also furnishes a starting point for the various methods of attacking the problem. The present paper covers a tremendous amount of ground—more than can be discussed in these remarks, limited to a few minutes. It represents a concerted attack on the problem based on the study of material that is abundant and subject to unusual opportunities for control in both human and animal specimens. These specimens are invaluable. In them, I wish especially to focus your attention on the part played by the epithelium and the cementum in the sum total of the changes that they portray.

FINE POINTS IN LOCAL ANESTHESIA*

By HOWARD C. MILLER, D.D.S., Chicago, Illinois

THE use of local anesthesia in its various forms has successfully passed through the experimental stages and has reached its rightful place among accepted dental procedures. Many think of local anesthesia as a method of injecting the anesthetic solution into the surrounding tissues under considerable pressure. This has come to us from its early use, when pressure was considered essential to success, and no doubt is the cause of many tissue lesions and much discomfort to the patient, producing considerably more primary pain and markedly increasing secondary cellular reaction.

Clinical experience has proved, without a doubt, that a solution injected slowly with only sufficient pressure to discharge it into the soft tissues along the mucobuccal fold, or into the deep tissues near the entrance or exit of the nerve trunk from its bony canal, will prevent many of the unfavorable sequelae that follow where the solution is infiltrated into the dense surrounding gum tissue.

It is not uncommon to hear comparison of the so-called infiltration and the deep block methods, when, in reality, anesthesia is produced in both by the solution infiltrating the nerve structure. In one, the solution is injected into or around the operative field, and, in the other, at some distant point from the field of operation. Never in blocking branches of the fifth cranial nerve is an attempt made to pierce the nerve sheath. When this does happen, it is the cause, in some cases, of prolonged anesthesia and, in others, of severe postoperative pain.

One of the greatest causes of technical failure is that the solution is not sufficiently near the nerve trunk for it to infiltrate the surrounding tissues and epineurium and to anesthetize completely the central nerve fibers.

There are those who still claim that the interference of a local anesthetic with the circulation has a great deal to do with many of the violent reactions and exacerbations that are seen. These claims are probably made without a thorough knowledge of the fundamental principles of local anesthetics and without careful clinical observation of their results.

There are others who believe that unnecessary pain and swelling are produced by the use of local anesthetics and that the blood clot in the tooth socket more often breaks down and disintegrates after three or four days.

The question of postoperative pain varies in different individuals and is governed to a great extent, when due to the anesthetic, by the solution injected and the manner of injection.

*Read before the American Society of Oral Surgeons and Exodontists, Philadelphia, Pa., Aug. 21, 1926.

There is a period of absorption after the action of the vasoconstricting agent has passed away, which varies from forty-five minutes to one hour and a half, this depending on the amount in the solution injected. There is dilatation of the vessels and an increase in the blood supply to the part. This dilatation is due to the compensatory action of epinephrin, which always manifests itself in a hyperemia of the part after its use. This period lasts from two to five hours, during which the injected solution is completely absorbed, provided its action corresponds, as nearly as possible, to the physiologic action of the living tissue cells. While absorption is taking place, the patient may experience some discomfort and soreness due to the use of a local anesthetic, but if he has been sufficiently warned of the possibilities of this discomfort and proper directions have been given to combat it, he will minimize the discomfort and report back, in many cases, that no pain was experienced.

The most common cause of swelling is the rupture of a small blood vessel by the insertion of the needle, which allows its contents to escape into the surrounding tissues. Too rapid injection, which may cause ballooning or distention of the tissues, also produces some swelling. Another cause is the use of a dull needle and careless manipulation of the syringe, all of which will traumatize the tissues unnecessarily.

The question of disintegration of the blood clot or the production of the so-called dry socket is a difficult one. This is possible in cases in which a general anesthetic has been used, as well as with a local anesthetic.

In order that the number of these disintegrations may be decreased, the operator should prevent, as far as possible, the entrance of the saliva into the socket or wound. After operation, the patient should not be allowed to rinse the mouth vigorously, but should be requested to bite on a small pack of gauze placed over the wound for approximately ten minutes. This permits coagulation to take place at the base of the socket without disturbance, preventing many of the postoperative discomforts that are commonly laid to local anesthetics. The patient is dismissed with instructions not to rinse the mouth vigorously for twelve hours. This procedure is particularly adapted to the lower jaw, where these complications are most prone to occur.

The selection of the anesthetic to be employed in any case is most important and rests with each individual operator, depending on the physical condition of the patient, the type of operation and the personal choice of the one making the selection. There are operators who prefer a certain anesthetic, and who therefore condemn the use of any other, not only in their own hands but also in the hands of others. This is unjust to the method condemned; for the successful operator is the one who selects the anesthetic best adapted to the case, and the one from which the patient is to receive the greatest benefit.

Strict adherence to asepsis is an important factor and must be adhered to throughout. There are many who give too little attention to the proper care and sterilization of the syringes and needles, both before and during their use, are careless in the preparation of the solution and give no particular thought to the conditions surrounding

the patient and to disinfecting the area of injection.

The use of proper anesthetic solutions and their preparation is a step that surely deserves some special attention. Because many proprietary anesthetic solutions have been on the market for years, and the natural tendency is to select the easiest means of preparation, too little attention has been given the anesthetic solution. The ideal anesthetic solution is a freshly prepared procain (novocain) solution varying from 1 to 2 per cent, with the addition of a small amount of vasoconstricting agent, such as epinephrin (adrenalin) or the synthetic product, "suprarenin."

Whenever referring to the anesthetic solution before patients, most operators speak of its as "novocain," in preference to "procain," some believing the two to be different in their composition. Procain is the term given to the compound which is made in America, and it is identical with novocain. The British term the same product anocain. This synthetic compound was formerly made in Germany, but under the provision of the Trading with the Enemy Act, the Federal Trade Commission took over the patent and issued licenses to American pharmaceutic concerns for its manufacture. The license issued makes it a condition that the product be called procain instead of novocain; also that the American-made product be identical with that formerly obtained from Germany. Therefore, the term procain should be employed in preference to novocain.

The fact that procain must be combined with epinephrin for successful anesthesia has led many to believe that these drugs are the cause of the unfavorable general reactions that are seen in some cases immediately after injection. While all data up to the present time tend to contradict this opinion, the amount used should be the smallest necessary to meet all requirements. These drugs exert a powerful action on the circulatory apparatus in producing an increased blood pressure, and even when administered in a solution of 1:1,000,000 will produce a slight local ischemia. The solution employed in general surgery, in which large amounts of local anesthetic are injected at one time, is a 1:100,000. Large doses of epinephrin are contraindicated in patients suffering from high blood pressure, and in patients who have diabetes or some severe heart involvement.

In a recent conversation, Hugh M. McGuigan, professor of pharmacology in the department of medicine at the University of Illinois, stated that he did not believe epinephrin in the usual amounts necessary for dental surgery would cause any disturbance. He spoke of the toxicity of procain, especially with rapid injection, stating that, in animal experimentation, when injections of procain were made rapidly into the heart, toxic symptoms developed quickly, but when injections were made slowly, large amounts could be injected with no toxic effect whatever. In his opinion, many of the unfavorable reactions will be overcome by slow injection.

Stock solutions are objectionable as their stability depends on the addition of some antiseptic or preservative, which, when injected, acts unfavorably on the tissues. The objection to the use of stock solutions is to be found in the report of the special committee of the American Medical Association investigating the toxicity of local anesthetics, in which procain was also

reported to be the safest local anesthetic when properly employed.

Many operators rapidly inject a 2 per cent solution of procain with the patient in an upright position and with no regard for age or physical condition. This, especially in patients past middle life who are in a state of lowered vitality, results in their feeling faint, with a rapid pulse, fullness in the chest and head and a distinct tremor. All of which can be avoided by the use of a weaker solution and slower injection, and always with the patient in a horizontal or semihorizontal position. This position is desirable in all cases when injection is being made, regardless of age and condition.

Some patients may experience a peculiar sensation over the entire body, especially in the extremities, following the injection of a local anesthetic. The face may blanch and break out in a cold clammy perspiration, the pulse becoming rapid, the expression strained and worried; all of which symptoms are the result of a disturbance in the vasomotor centers either from fear or from the injection of the solution.

The apprehensive patient should be reassured and his confidence gained through the attitude and ease of the operator and assistants. Some explanation should be made of what the patient is to experience, such as the sting of the needle and the tingling and numbness of the part; any explanation that seems adaptable to the patient to be operated on, this varying in all cases.

The attitude of the operator will do much to relieve the patient's mental disturbance, which causes many of the nervous symptoms that follow the injection of a local anesthetic and are blamed on the injected solution.

Patients who have had teeth removed previously under nitrous oxid-oxygen or have ever taken a general anesthetic believe that all anesthetics should be administered when the stomach is empty; consequently, many patients come into the office without having eaten for several hours. Contrary to this belief, patients should be advised to eat as usual, as syncope is less apt to follow in a patient who has eaten than in one who has not.

The fundamental basis of local anesthetics is a thorough knowledge of the anatomy of the parts involved, followed by a definite technic.

Local anesthetics come to us with a rich inheritance of usefulness and success, not only in dental surgery but also in the field of general surgery, where they have been employed for years by men who are skilful and who believe that many cases are better handled under local than under general anesthesia.

The successful use of local anesthetics involves the careful application of its fundamental principles in every case in which it is employed; and as its basis, diagnosis, scrupulous asepsis, proper anesthetic solutions, a knowledge of anatomy and an exact technic are essential.

30 North Michigan Avenue.

DISCUSSION

John J. Ogden, Memphis, Tenn.: Dr. Miller's subject is one with which we deal in every-day life. I do not think that any of us pay enough attention, at all times, to our technic for the administration of local anesthetics. It is just as important to give a local anesthetic properly as it is to administer a general anesthetic. There are too many in our profession that think that all there is to local anesthesia is to insert the needle into the tissues and inject any "good local anesthetic," with the emphasis on the "good anesthetic." Most operators agree with Dr. Miller that slow injection of a

solution with only sufficient pressure to discharge it into the soft tissues along the mucobuccal fold or into the deep tissues near the entrance or exit of the nerve trunk from its bony canal is the proper procedure and will not give unfavorable results; but he does not say anything about injection into the hard tissues on the lingual of the maxillae for the infiltration or blocking of the inner nerve loop. I dare say that there is not one present who does not cause a great deal of pressure in making this class of injection. It is true that anesthesia is produced by the solution infiltrating the nerve structure in both the so-called infiltration and deep block methods, but the technic used by some operators depends on the pressure about as much as the solution to produce anesthesia. The prolonged anesthesia that we have after some of our operations is caused more by trauma to the operative field than by the piercing of the nerve sheath. We have all had patients remark to us, "Mrs. S. had her jaw blocked for the extraction of a lower tooth and her jaw was numb for several months." It is not at all uncommon to have a case of prolonged anesthesia of the mandible following the administration of nitrous oxid and oxygen. I think that most operators will agree that we have more cases of postoperative pain after local anesthesia than when a general anesthetic is employed. Tissue repair is more rapid and more normal after an operation in which a general anesthetic is used; that is, all things being equal. Another common cause of swelling or ballooning of the tissues is the failure to exclude all the air from the syringe before making an injection. Novocain is the common name for the anesthetic drug, so why try and educate the public to some manufacturers' trade name? I should like to ask Dr. Miller if, after every operation in which local anesthetic has been used, he places a piece of gauze over the wound for approximately ten minutes. Ten minutes is a long time, and in cases of multiple extraction, the patient would want to expectorate.

Arthur E. Smith, Los Angeles, Calif.: The Therapeutic Research Committee of the Council on Pharmacy and Chemistry of the American Medical Association collected and studied information on the occurrence of accidents from the use of local anesthetics. They investigated: alypin, apothesin, butyn, cocain, procain and stovain. Two members of the Committee reported that apothesin caused most frequent complaint among those who reported to them, especially because of sloughing that followed its use. Cocain, stovain, butyn, apothesin and lypin were about equally dangerous, while procain was safest. Cocain caused the greatest number of deaths. Procain was used more frequently than any other local anesthetic and, if carelessly used, was capable of causing sudden death. No fatalities were reported following the use of the local anesthetics in operations on the mouth or jaws, but there were many reports of abscess formation, hematomas, and long-lasting pain following their use. These effects are almost certainly attributable to lack of care in the selection and preparation of the solution and the want of asepsis Many operators use stock solutions which are kept on hand for some time and which do not remain sterile. Some of those used contain epinephrin, which decomposes on standing. All doses of local anesthetics, however applied, should be measured accurately. This is impossible when preparations of unknown composition or concentration, including those that have deteriorated, are used, and the Committee condemns their use as unscientific and dangerous. Stock solutions of local anesthetics which have been used for numerous injections are seldom sterile and their routine use is condemned. All solutions should be freshly made and should be sterile.

Dr. Miller: The anterior palatine nerve, at the posterior palatine foramin, requires no pressure other than that sufficient to discharge the solution. The nasal palatine nerve at the anterior palatine foramin possibly requires a little more pressure, but only enough to discharge the solution into those tissues. Those are the only injections necessary in the palate and I can't see the necessity of great pressure. Prolonged anesthesia is produced by two things: trauma and the injection of alcohol or some antiseptic solution in which the syringe is kept. Many times, all the solution is not cleaned out, and a few drops of alcohol enter, which makes a prolonged anesthesia.

Boyd S. Gardner, Rochester, Minn.: Trauma with the needle?

Dr. Miller: Such as a blind curet. We many times curet fine particles of the nerve. The needle trauma is only slight, but it is

possible. As to the term "procain," it is not a trade name, but was ordered by the Federal Government. Many believe procain and novocain are two different products. They are identical. As to the question of packing the mouth, I assure Dr. Ogden that practically every case, and particularly in the lower jaws, retains the pack for approximately ten minutes, I find. This is rolled loosely after the patient expectorates, and the patient is expected to bite on it. The common practice is to have a glass of water ready, and the minute the tooth is out, the patient starts spitting as fast as he can, and consequently disturbs the formation of the normal blood clot. I sometimes have dry sockets, but they have decreased with the use of the packing. Another thing is too long exposure to air. Another point that might be of interest is the variance in procain solutions today. The United States Government is conducting an investigation on all procain tablets. I went to the Federal Department in Chicago and tried to get the exact figures of the variance in the making of tablets. For instance, they take one particular brand and investigate that right straight through, and the percentage of difference in the content and the manufacture of those tablets determines the quality; which might account for some of the cases in which, while we use a particular make of tablet, one box produces syncope.

F. B. Hower, Louisville, Ky.: What about the ampules?

Dr. Miller: Ampules are not particularly considered in the light of a stock solution, although they are to a certain extent. Most of them, in fact all of them, contain some preservative. Epinephrin cannot be kept in solution any time without a preservative, and the manufacturer will admit that there is a preservative. There are different solutions, and just how much disturbance this variation produces in the tissues, there is no way of telling; but the ideal method is to prepare a fresh solution in every case.

H. A. Elmquist, Des Moines, Iowa: How do you keep soot and other particles out of it?

Dr. Miller (closing): We cover it with a gauze pack or porcelain dish. The particles in the tablets many times are epinephrin that has decomposed. It will produce specks in the solution. If these are dust, I should say discontinue the tablets.

HISTORY OF DENTISTRY IN BELGIUM*

By EDMOND ROSENTHAL, D.M.D., Brussels, Belgium

THE history of Belgian dentistry is that of a long struggle that may appear incredible in this country where our art and science has had its proper standing for so many years. For ever so long, neither our governmental authorities or parliament nor the medical profession took any notice; nor did they attach any importance to dentistry. It was completely ignored as if nonexistent. All our efforts, many times renewed and emphasized with the conviction in our minds and heart, were annihilated by a spirit of scorn due to the total ignorance of the importance of the service rendered by those of our profession who had in their care and were responsible for the preservation of public health.

As you are aware, after the battle of Waterloo and up to 1830, Belgium and Holland were united and formed a single country, known as the Low Countries, under a Dutch king.

*Read before the Section on History, Science and Libraries at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

Strange as it may appear, dentistry, as well as medicine and chemistry, is still governed by a law voted on at the time and during the Low Countries government, in 1818.

Medicine has become entirely transformed; the number of medical practitioners has increased tenfold; numerous specialities have arisen, and its normal status has been considerably modified. Dentistry, which was at its birth then, is now a fundamental branch of the healing art. Its importance is recognized the world over. It has many schools, with teachers rivaling in science those of any other branch of human activity. Thousands of pupils attend many lectures and numerous clinics, but immutable is the law of 1818. It seems immortal and has stood all attacks, criticisms and protests during all these years. This law established a special board of examiners in each province, before which candidates had to present themselves to obtain a diploma, giving them the right to practice dentistry in that province only and nowhere else. These boards of examiners were made up of the provincial medical authorities, and for many years, no practitioner having any experience in dentistry was allowed to assist them in their task.

Candidates were called on to prove a certain knowledge in special anatomy, special physiology and dentistry in general. No preliminary education, no special preparation, no general knowledge of any kind was necessary. Illiterate people could present themselves, and if they could describe three bones of the head, give the proper number of teeth in the human skull and discriminate a cuspid from a molar or a key of Garangeot from a blunt excavator, they were bound to be consecrated *dignes intrare* in the dental profession and to operate on their fellow citizens.

These peculiar and rather primitive conditions prevailed for more than seventy years, when, owing to the efforts of a certain number of dental practitioners, modification of the law was obtained, and candidates had to prove, before presenting themselves before the examining boards, that they had been apprenticed during two years in a dental office. But the curriculum on which they would be examined and the makeup of the boards of examiners were only slightly modified.

This brings us to the beginning of this century. At that time, an important event took place in the history of dentistry in Belgium; an event which has had many consequences, not at all forseen by the man responsible for this great change.

This man, a medical man (no use to give you his name; he is dead now), began a literary campaign clamoring *urbi et orbi* that dentistry was a farce; that any medical man ought to be able to learn its secrets in four or five lessons; that he himself was capable of teaching any one this well paying trade. He asked for pupils, whom he bound himself to make fit in a fortnight to earn immense wealth, in no time, as all dentists did. This prospective was too tempting for many, and numerous medical men who had no knowledge of the dental branch of the healing art began to practice it without any theoretical preparation worth speaking of, and in perfect ignorance of its fundamental practical rules.

The consequences that could have been forseen with a little judgment were not long in showing themselves.

In operative dentistry, on account of the general ignorance of the public as to what should be proper treatment and results, they, for a time, could hide their deficiency. In mechanical dentistry, the state of affairs was different. A plate fits well or does not; holds its position in the month or drops down; articulates well or is defective during mastication. Its appearance is satisfactory or unnatural and unsightly. Its presence is bearable or it inflicts pain. All those defects are evident to the least educated patient. The unprepared practitioners soon became aware of their want of practice in these matters and called to the rescue the simple dental mechanics, who, though not at all educated to attend to the chair, were more competent in certain practical facts than the would-be medical dental practitioner.

They knew the qualities required to model a perfect plate from a cast. They had some knowledge of the requirements of a trustworthy articulation. They were acquainted with the way clasps ought to be constructed and fastened to teeth so as to hold the plates in their proper place, and so on. And those unqualified men became the right hand of the qualified one, and did the main part of their work, taking impressions, taking the bites, assorting the teeth, mounting the pieces, trying them, adjusting them in the mouth. They received for all these services the salary of a mechanic and nothing more. They were not long in finding out how ignorant of all the foremost and even the most simple principles of dentistry were those who required their services, and who yet treated them as collaborators of an inferior rank. They also understood that although they were doing all the work and assuming all the responsibility as to results, they were receiving in return neither honor nor appropriate fees. Their names were unknown to patients, working anonymously as they did.

After a few years, they tired of this unsatisfactory position, and many came to the conclusion that if they were capable of turning out good work from beginning to end, work that was bringing great profit to others, they could very well do it themselves to their own interest, and, one by one, they offered their services directly to the public, and at a lower rate than that asked by the medical practitioner for the same services. Considering that they had worked in his stead, they had every certainty that the patients would have equal satisfaction whether operated on in their offices or in somebody else's.

The number of these men multiplied quickly as the success of the pioneers encouraged others to follow their lead. Little by little, from prosthetic dentistry they began to perform operations, timidly at first, more openly later on.

This sequal of events, of course, did not develop without energetic protest from the legal profession. But the law regulating the prevention of illegal practice of the healing art is such that to prove a case was of the greatest difficulty, and very often the illegal practitioner would escape without any penalty whatsoever.

About the year 1883, two dental societies were existing in Brussels, the *Association Générale des Dentistes de Belgique*, the first to be established, and the *Société Belge d'Odontalogie*. Some local groups were also formed in provincial towns, such as Antwerp, Ghent, and Liege.

These worked separately and virtu-

ally ignored each other. One dental journal, *Le Journal Dentaire Belge*, was started and was published regularly. We may say that, from that date, dentistry began its public life and inaugurated its struggle toward a better standing.

In 1899, the obligation for candidates to prove that they had had two years of training was given up, and a considerable step forward was made by the government. From a simple informal and nominal curriculum, the standards were raised until the students had to be candidates in medicine before they could present themselves to the provincial board of examiners to try to obtain a diploma in dentistry. Of course, such a step immediately raised the standard of the profession. Formerly, the future dentist could be unlettered and still obtain his diploma. And, all at once, without notice, this decree compelled him to be in possession of a certificate attesting that he had been a successful pupil in a gymnasium; this meaning six years of study of the liberal arts. Also, previous to a professional examination, the student had to be a candidate in natural sciences and also a candidate in medicine, which meant, altogether, three or four years of study in a university, each one ended by difficult examinations.

But this decree did only organize the preliminary studies necessary to become an educated dentist. The organization of dental studies was totally ignored by the authorities. This complete change was decided on by the ministry on education. It was not the object of a law and could not be discussed in our parliament. Dentistry, in general, did make a firm stand against this new ruling because of its incompleteness. Five years of elementary school work, six years in a lyceum, four years of university work, all to end in such a state of confusion. The young men who had been successful in all the many branches, including Latin, Greek, chemistry, physics, general anatomy, histology, general physiology and so on, in order to become a dentist, was, at the age of 22, the possessor of an immense amount of theoretical knowledge but without the means of following his career and learning theoretically and practically the profession towards which he felt inclined.

The dental profession protested against such an unsatisfactory state of affairs, and as a consequence, from 600 dentists existing in Belgium at the time of the promulgation of the degree, the number fell to 450 for a population of over 7,000,000 inhabitants, or one dentist to every 16,000 people. This did not change in the least the opinion of the authorities, who remained immovable. Our speciality continued to be considered of no importance, and the measures taken against it seemed to have been plotted to arrive at its total disappearance.

The Belgium dental practitioners did not remain unmoved by this antisocial attitude, and began action by uniting the different societies spread over the country into a national dental federation. This was a most important step toward the organization of the so-much depreciated profession, and soon its importance and strength were evidenced.

Considering the total absence of dental schools in the country, the first thing to do was to fill that void, and, in 1912, the first Belgian dental school was founded, under the auspices of the

Belgian Dental Federation. The school was opened in a temporary hired building. A fund was afterwards collected among the dentists themselves; a site was bought, and soon a practical and graceful building began to take shape. It was nearly complete by 1914.

About this time, the medical men who had adopted dentistry as a calling began to find out that the former campaign of their colleague was clouding its real importance and the many difficulties associated with the profession. They found that it took more than four or five lessons to make a perfect dentist from a medical graduate, and they also founded a school of dentistry, called the School of Stomatology. Small Belgium that had been, up to 1912, without any dental center of education found itself possessing two of them. The stimulation of all kinds of human activity tends to improve the way and means of realizing one's aim, and thus the existence of two schools had a favorable influence on the standards of each. The universities themselves did not remain indifferent to this progress, and also organized a kind of dental curriculum. This, at first, was intended more to give the medical students a taste of dental science and art than to train regular specialists.

However, difficulties were experienced owing to the original way the dental curriculum had been arranged by the government. The four years of natural and medical sciences are filled up with many lectures, laboratory and dissection work. No time was left for dental studies during these four years, and after them, as they were common to dental and medical preparation, pupils would prefer to continue their medical studies, to become medical graduates rather than spending about the same time to obtain only a dental diploma, considered by many as of an inferior class, and as giving a lower standing in life than the medical diploma. As a consequence, the attendance of the dental schools was not very great and did not repay the efforts and pains taken to establish them.

In 1914 came the World War. All the institutions of higher education were closed under the principle that the young men who had remained at home must not have any advantage over those who were risking their lives to defend their country. During all those years, ever since the fatal decree of 1898, the number of illegal practitioners had increased continually from the very causes mentioned above: (1) the importance given to mechanics by medical men who were compelled through their want of professional preparation to admit them to the chair, to perform all kinds of operations of which the medical men were ignorant; (2) the need of more dentists by the public; (3) the leniency of the magistrates called to judge illegal practice, and (4) the difficulty of proving a case in court.

A professional syndicate was formed which was intended to defend the material interests of the dental practitioners, apart from any standarized doctrine, and with a view to uniting the several societies and gathering funds and appointing a special lawyer to pursue all known cases of illegal practice. Here again, we were handicapped by difficulties arising from the fact that the Belgian dental profession was divided as to the principles that should predominate in dental education. One section would defend its standard; that is, an independent professional education from

beginning to end within four years of study, two theoretical, and two both theoretical and practical; and the others spread the doctrine high and low that only the medical degree should grant to any one the right to practice dentistry, which they had only lately found out to be a branch of the healing art and therefore belonging solely to the medical profession.

Those that shared the latter theory were so hidebound in their opinion that they would not join the neutral syndicate because this included members from the other side. Naturally, this syndicate, not reflecting the opinion of the whole of the dental profession, did not succeed in impressing the courts with the fact that their claims were well-founded, and so lost most the cases introduced before the court. Encouraged by their success, the illegal practitioners became more and more numerous.

At the time the war broke out, as said before, the schools closed for the time being, the dental school confining its activities to organizing and ambulance service for the wounded. Brussels, unhappily, was soon occupied by the Germans, and the organization had to cease activities. Every one had assisted the staff at a great sacrifice. Fifty beds were collected with the necessary linen, blankets and so on. A complete surgery was fitted up and a general surgeon was appointed to take in charge whatever wounded would be given under his care. The intention was to make of the dental school a center for surgical prothesis of the face. The dental laboratory, being on the premises, would have been of great help.

But all these efforts were useless, as the Germans closed most of the many hospitals that had been thus improvised.

The building then was used during the whole of the war as a dental clinic, where the teeth of the population were taken care of free of charge in all cases calling for operative dentistry and at cost price in prosthetic cases. Many practitioners gave their time and care to the poor and never grudged their efforts to help their fellow citizens to the utmost of their possibilities during those four unhappy years.

Though nearly the whole of the territory of Belgium was occupied by the enemy and practically cut off from the rest of the world, it came to our knowledge that the number of dentists near our fighting army was totally insufficient and that our poor soldiers, who already had to suffer so much from the dreadful conditions they were submitted to in the trenches, had to endure torture from toothache without any hope of help, which was unobtainable, being practically nonexisting.

Many practitioners responded to the call and offered their services, ready to cross the lines at their own risk. This benevolent offer was transmitted by one who took the lead and succeeded in Havre, where the Belgian government had been established. But the proposal was declined, the authorities considering that one dentist for every 10,000 men was quite sufficient.

We are now nearing the end of this too long struggle.

The war is over. Our country has been impoverished, destroyed in great part and tortured. It has to be rebuilt morally as well as materially.

Now was the time to try again to establish Belgian dentistry on its proper footing. There was so much to do that the parliament had no time to attend to this side issue. However, pressed by many reports sent by the

Fédération Dentaire Nationale Belgique and other professional bodies, and also influenced by public opinion, the government at last awakened to the importance of the dental problem, appointed a commission of members of the profession, half of the number supporting the principle that dentistry should be an independent branch of medicine and half that dentistry, being a part of the healing art, should be practiced exclusively by medical men. Their task was to come to an understanding as to a practical and useful curriculum for the training of future dentists. There were many sittings and discussions, and mutual concessions were made. This commission at last came to a unanimous decision and presented to the consideration of the government an educational program including five years of studies, three to be spent at one of the universities and two in dental schools.

Would this proposition be the solution of the problem? Was dentistry at last to have a proper standing in our community and become a recognized liberal profession instead of being considered of minor importance and continuing to be neglected? We were not at the end of our difficulties yet, and the struggle was not ended by this seeming victory, curious as that may seem. The government did not adopt the findings of the commission, and, instead of proposing a period of five years of study, had an entirely new program elaborated, compelling students to attend a six years' course before they could present themselves before a board of examiners to obtain a final diploma. This resolution created a moment of stupor in the Belgian dental world. No student would ever try to obtain a dental diploma, if it required six years to possess it, while only one year more of study would make of him a medical man. As the medical diploma confers the right to practice dentistry, as the title of doctor in medicine has a higher standing with the public than that of dental surgeon, the dental schools might as well close their doors, if this proposition should be adopted. The proposition satisfied no one and mystified the members of the commission, who where under the impression that the result of their work, thought and time would be adopted by the government. They did think that, if they had been called to solve such a question, it was because they were supposed to have a better experience in the matter than a simple functionary of administration. Their opinion was despised; the results of their efforts were annihilated. Belgian dentistry had not gone a step farther, and nothing to speak of was done to prepare new practitioners to take up this profession as a calling.

The need of the population increased. The number of regular and legal dentists diminished steadily, while the inspection of school children made it clear that the need of qualified dentists was more urgent than ever. A temporary measure was resorted to: A number of soldiers had entered the dental schools when the war broke out. Considering that it was an impossibility after this great interruption in their studies to compel them to return to the university for four years, and as a reward for services rendered to the mother country, the authorities allowed them to pass a nominal examination, conferring on them the right to practice dentistry.

Then there arose the question of all those who were practicing illegally.

This was also settled in a very liberal way, and these practitioners had only to attend a dental school for one year and then pass an examination before a suitable board of examiners.

All these measures were temporary, and no definite solution of the problem was yet arrived at. A new step forward has, however, been taken. The syndicate for the defense of the material interests of the dental profession in Belgium has been reorganized on a basis that seems now to satisfy the great majority of those practicing dentistry. This is a field in which all parties concerned may now meet and learn to know each other better. Many misunderstandings will be cleared, and this will smooth the way to a standard agreeable to all concerned as to what the future shall be.

SUMMARY

To summarize: These are the principal points in the history of dentistry in Belgium:

1. The general attitude of indifference on the part of the government and the medical profession toward dentistry.

2. The campaign claiming the exclusive right of medical graduates to practice dentistry, at the same time proclaiming that the knowledge of this branch of the healing art could be acquired in a fortnight at the utmost.

3. Promulgation by the authorities of a decree that dental students must possess a full course of preliminary education and four years of university training in order to acquire the certificate of a candidate in medicine; no dental education being provided for.

4. Founding by the dentists of a private dental school.

5. Founding by the stomatologist of a private school of stomatology.

6. Appointment of a commission by the government to fix a proper curriculum for future dentists.

7. Refusal by the authorities to accept the solution proposed by this commission and promulgation of a new degree establishing a six year course of study.

8. Appointment of a new commission, the results of which are pending.

And here we are at the present moment. The question is still being studied, after 108 years. A new special commission is once more appointed. Hopeful gleams of what is being arranged there shine out, though all is done under the cover of perfect secrecy. Will we arrive at a satisfactory conclusion? Let us hope so; but we are rather skeptical, judging from the past.

We are sorry to present such a poor account of what has been done in our country. Individuals have done their best, having a high ideal and sparing no time, effort or money to put dentistry in Belgium on the same footing as it is in so many countries. Partly on account of the diversity of opinions between stomatologists and dentists, but mostly through the culpable indifference of the government, no proper position has so far been granted to our beautiful and useful profession. To a small extent, a certain improvement has been made over the former state of things as contact has been established between the state and the profession. The door is ajar, and dentistry is setting foot among the organized liberal professions. Let us hope that it will be strong enough to push the door open and enter with all the consideration due its value, scientific basis and public usefulness.

CHARACTERISTICS OF NITROUS OXID GAS AS AN ANESTHETIC AGENT, AND SUGGESTIONS RELATING TO ITS ADMINISTRATION IN DENTAL PRACTICE*

By JOSEPH P. HENAHAN, D.D.S., Cleveland, Ohio

CONSIDERING the characteristics of nitrous oxid gas as an anesthetic agent, we see that it is nonirritating; that it is not absorbed by the cells or tissues; that, during its sojourn in the organism, it forms only a loose mixture of unknown nature in the cell, and that it is freely and almost instantly given up when oxygen is admitted to replace it.

We also know that: 1. It is a respiratory stimulant. 2. It is a circulatory stimulant. 3. It is an anesthetic which produces unconsciousness in a few seconds. 4. When inhaled beyond the point of safety, it is a paralyzing agent which affects all brain centers, with the final result that respiration is arrested, to be followed shortly by arrest of heart action.

The aim, therefore, of the anesthetist when administering nitrous oxid, either by itself or in combination with oxygen, should be to take advantage of the many virtues of the gas and to prevent the appearance of any untoward symptoms.

Nitrous oxid by itself is respirable on the average for only fifty-six seconds; that is, from the beginning of inhalation until the development of the signs of asphyxia less than one minute will elapse. Therefore, operations requiring time and care should not be undertaken with this type of anesthesia. It can be repeated, of course, on occasion, but such procedure can be regarded as makeshift.

Without admixture with oxygen, nitrous oxid should not be administered beyond certain limits, nor should its administration be repeated frequently at one sitting. Asphyxia, once present, places a tremendous and sudden burden upon the vital organs, which is sufficient to produce sudden relaxation or collapse. It unnecessarily creates risk by forcing already strained organs to withstand repetition of the irritation.

When anesthesia is at its most profound stage under nitrous oxid unmixed with oxygen, the signs of oxygen privation also are most pronounced; the skin is blue or purple; the pupils are widely dilated, indicating paralysis of pupillary control in the central brain; breathing is stertorous, owing to paralysis of the muscles of the pharynx; there

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is jactitation and loss of rhythm of breathing, due to paralysis of muscles of chest and extremities.

In children, we often see opisthotonos even before cyanosis appears.

In order to induce a nonasphyxial type of anesthesia with nitrous oxid gas, it is only necessary that a quantity of oxygen be admitted. This amount varies in all cases, but, when properly estimated, produces anesthesia of a most satisfactory character which can be prolonged to great lengths of time with safety.

The presence or absence of cyanosis forms the basis of our technic for the administration of nitrous oxid and oxygen. Cyanosis is the first symptom of asphyxia. It must be regarded as the forerunner of other and grave symptoms; and it is a definite signal to us that oxygen is needed by the tissues and organs.

Therefore, if cyanosis is present, at that time the anesthetic must be considered to be as of straight nitrous oxid character, and oxygen in sufficient quantity must be turned in to correct the balance; or the only other alternative should be resorted to: lifting the mask off the face.

Anesthesia of the proper character under nitrous oxid and oxygen is recognized by involuntary breathing, strong and measured. The pulse is strong; the skin is normal or may be slightly pinkish or pale; the pupil is normal in size; the eyeball may be rolling; the lid may be closed or open; often, there is a warm perspiration.

The stimulating effect of the gas is responsible for the strength of the respiratory movements and the perspiration.

Fortunately for the dental anesthetist, the great majority of patients present no special or difficult problem. They submit gently and show an average susceptibility to the affect of nitrous oxid, and an ideal anesthetic condition is quietly and easily induced.

There is a minority which must have special consideration and special technic in order that anesthesia can be induced at all. These we are inclined to designate as our difficult cases.

In speaking of the technic of anesthesia administration, it can be said that, by the crude process of simply placing the inhaler on the nose or face and turning in a quantity of nitrous oxid, the patient will become anesthetized; but if anesthesia is induced in this crude manner, there will be much unnecessary struggling on the part of the patient. The struggling usually indicates discomfort from which the patient is attempting to escape. If this state of affairs prevails, the patient relates that there was choking, strangling and suffocation.

Many patients who, with a little patience, could be easily and smoothly anesthetized enter the class of difficult cases through a lack of consideration on the part of the anesthetist, which causes discomfort to his patient and unnecessary trouble for himself.

No set technic can be prescribed, and no machine can be set by which nitrous oxid and oxygen can be administered, and be expected to give uniform results.

The oxygen requirement of every patient varies, as does his susceptibility

or resistance to the effects of nitrous oxid. Even the same patient will show different requirements on different days, and nearly all patients require more oxygen and less gas as the time of anesthesia is prolonged.

Aside from the class of patients which we can classify as average, there are two classes of patients which can be classified as difficult, for opposite reasons: (1) those who show a pronounced susceptibility to the action of nitrous oxid and pronounced requirements of oxygen, and (2) those who show a great resistence to the action of nitrous oxid and require a clear unmixed gas for a long time before anesthesia can be induced.

In either case, when sufficient gas to induce unconsciousness has been inhaled, the result upon the organism is the same, be the required quantity great or small.

The action of nitrous oxid on the substance of the brain, as compared with that of other gases, is interesting. It is known that, as a result of oxygen privation during nitrous oxid inhalation, the dura is thickened or swollen, and, in consequence, presses against the walls of the cranium. This is proved in brain operations under nitrous oxid and oxygen anesthesia in which a window has been created in the skull by the trephine.

As the amount of oxygen in the anesthetic mixture is decreased, the evidence of asphyxia becomes manifest and the dura begins to bulge through the opening. When oxygen is admitted again in sufficient quantity, the brain recedes to normal size and position.

With this knowledge, we understand the cause of much of the disturbance which we see under nitrous oxid and oxygen anesthesia. The swelling of the brain substance causes intercranial tension, with pressure on all brain centers, causing, before consciousness is lost, the symptom known as tinnitus, or the ringing of a thousand minute bells. Later, all kinds of hallucinations develop, during the subconscious period. These hallucinations are very vivid sometimes, and the patient afterwards believes them in all seriousness to be facts.

The more evident the condition of asphyxia, the greater the thickening of the brain substance and the more pronounced will be the symptoms. To this can be attributed the cause of dreams relating to runaway automobiles, hold-ups and other fancied dangers.

In dental practice, we see these conditions in their most pronounced form. In hospital practice, many of these conditions are eliminated, or at least minimized, as the result of preliminary preparation for anesthesia, including sedative medication. This treatment quiets the patient, and, at the same time, shortens the time of induction and increases the susceptibility to the gas.

On the other hand, anesthetics in the dental office must be regarded somewhat in the same light as emergency anesthetics in hospitals, the patient being anesthetized and operated on without previous preparation.

There is every good reason for previous preparation for dental anesthetics in every practical way, as relates to diet and cathartics. It is a simple matter to advise all patients, when the appoint-

ment is made, to fast for at least three hours previous to anesthesia and to eat only a light meal before beginning to fast.

I have found that it is, in most cases, better for the patient to have a cup of black coffee and a slice of toast for breakfast three hours before operation than to fast for a longer period. It improves the condition of the patient before, during and after anesthesia.

If this simple procedure is resorted to as a matter of routine, much of our postanesthetic nausea will be eliminated.

Under proper conditions, but not as a routine procedure, I would also recommend a hypodermic of morphin and atropin in the case of an excessively apprehensive patient. If the operation is prolonged, it controls the tendency to shock.

Alcoholic or septic intoxication, or autointoxication of any type, will cause great difficulty in inducing anesthesia. The condition seems to increase the resistance to the anesthetic. Alcoholic intoxication creates one of the most dangerous conditions which can be met with. The patient soon begins to have hallucinations and, in consequence, begins to struggle, usually violently. When anesthesia is forced to the saturation point the patient often suddenly collapses, with a sudden arrest of breathing. Septic intoxication, due to acute inflammatory conditions, when a great quantity of pus is present, will create similar symptoms, but not quite so exaggerated. I advise the avoidance of cases of those who are actually under the influence of liquor. A condition akin to intoxication will be found in patients who have indulged in various kinds of drugs or medicines for a sufficient time to become thoroughly saturated, in their efforts to allay local or general pain symptoms. These patients invariably show an acquired resistance to the action of nitrous oxid.

In the treatment of nervous patients, as well as normal ones, if the best results are to be attained, the anesthetist must depend on his power as a psychologist to quiet the patient. With exaggerated cases, this can be accomplished only with sympathy, firmness and patience.

I believe that a great mistake can be made if the anesthetist overdoes this mental preparation by drawing it out. It is easy to talk too much at this particular time.

Recommendations which I make regarding methods and technic of administration naturally are the ones which I follow in my own cases.

In cases of children about three years of age, especially if the patient is crying, I advise that the anesthetic mixture be started with a flow of oxygen greater than the amount of nitrous oxid, placing the inhaler over the nose and mouth and, as the case progresses, diminishing the amount of oxygen. Anesthesia will be recognized by the fact that the child becomes quiet and breathing is even and measured. The lid reflex will be absent, and the skin should be pink. A large oxygen content will usually be tolerated in the anesthetic mixture in these cases because the susceptibility to the anesthetic is great.

Aged people should also be carefully prepared. Occasionally, they develop serious symptoms quite unexpectedly. It is never safe, in cases of old persons, to have an anesthetic mixture which causes

struggling. The vital organs are easily shocked, and the patient goes into a state of collapse. Therefore, I advise that anesthesia be slowly induced by admitting large quantities of oxygen at the beginning and reducing it as the requirements of the case indicate.

For patients suffering from wasting diseases, such as anemia, tuberculosis or constant mild fever, gradual loss of weight, etc., it can be expected that there will be a marked susceptibility to the anesthetic action and a great demand for oxygen.

The proper procedure in these cases would be to admit a plentiful supply of oxygen from the beginning, gradually decreasing it and noting the effect. In these cases prolongation of the second stage of anesthesia is not serious, because the patient does not grow restless.

Asphyxia should be guarded against.

For the average patient, man, woman or child, and these furnish the great majority of our cases, I advise starting with the air valves from the inhaler open so as to admit the atmosphere freely The gas is allowed to flow slowly, the patient being advised to relax completely and not to hurry. After four or five inhalations, the flow of gas is increased, the air valves are closed and about 8 or 10 per cent of oxygen is admitted to the mixture. The quantity of mixed gases flowing should fill the bag until it is gently distended. It is necessary at all times to supply a flow of gas which will be comfortable to the patient, so that he will not find it necessary either to drag, in order to get sufficient gas to fill the lungs, nor, on the other hand, to cause resistance when exhaling to an excessive rush of gas. The guide to developing anesthesia will be the color of the skin. Cyanosis should not be permitted to become pronounced. The guide to anesthesia will be an even respiratory measure, the absence of the lid reflex and normal size of the pupil.

In difficult patients, such as robust men of outdoor occupation, who do not respond to average technic and in whom the induction stage is prolonged, developing at the same time symptoms identified with a prolonged excitement stage, I advise the withdrawal of all oxygen and the supply of a plentiful flow of gas. These cases, of course, will develop cyanosis and, in time, other symptoms of asphyxia. These cases must be carried to the extreme of straight nitrous oxid anesthesia. This will result in jactitation, at which time oxygen is admitted. The patient then relaxes and respiration becomes strong and even. This process is designated as saturation. For some time after the patient becomes relaxed, anesthesia must be kept profound or the patient will quickly return to the excitement stage. As time goes on, the patient shows a tendency to become more quiet, if the anesthetic mixture is properly maintained.

In these cases, cyanosis will be present, but it is not a serious symptom, provided the respiration is strong and measured and the patient is not struggling.

The chief trouble to be avoided is struggling. We can avoid it: 1. By having the patient quiet, resigned and thoroughly relaxed before induction is begun. After induction has begun, the patient is advised to continue breathing quietly in any way that is comfortable and easy. If the patient attempts to talk or swallow, he is advised it will cause choking. 2. By avoiding cyanosis,

which is a sign of asphyxia, and in itself the cause of unavoidable struggling. To avoid it, administer oxygen.

DISCUSSION

Homer C. Neale, Pittsburgh, Pa.: Dr. Henahan has given us in a clear and understandable way the facts and fundamentals of administering nitrous oxid and oxygen. In the practice of oral surgery and exodontia, the normal case gives us little trouble. It is the abnormal case we are mostly interested in, and Dr. Henahan has given us some valuable advice along this line. The presence of cyanosis, a symptom of trouble, should be corrected at once by the introduction of more oxygen, except in some cases as described in the paper, and it might be necessary in some classes of surgery to have this degree of relaxation, but is unnecessary in most dental operations. Premedication should be practiced when possible. Yet it is remarkable the success we have in most cases coming from the street and offices, without any preparation, with no indication of unpleasant symptoms arising. Dr. Henahan did not classify the cases of pregnant women. These cases we meet with every day. In my opinion, they should be handled as anemic or tuberculous patients, with a slow and easy induction and enough oxygen, that there may be no strain, shock or strangling. The test given us by Dr. McMechan at Cleveland (the breathing test) has been of great value to me in determining the ability of the patient to undergo anesthesia. The test is made by instructing the patient to inhale and exhale. On the second or third inhalation, the thumb and forefinger are placed over the nose closing the nostrils. The mouth is closed, the palm of the hand being placed over it, and the patient is instructed to hold the breath as long as possible. If a patient can retain his breath for forty seconds or longer, he is usually a safe subject. Otherwise, the shorter the breath holding period, the poorer the risk. I always feel more at ease after the patient has successfully passed this test.

J. A. Heidbrink, Minneapolis, Minn.: Dr. Henahan has brought out many excellent points in anesthesia administration. I agree with the statement that a pure nitrous oxid administration is uncomfortable to the patient (because it too rapidly displaces oxygen in the blood and causes a feeling of suffocation), and causes excitement. Avoidable asphyxial symptoms are produced and an unsatisfactory anesthesia results, in many patients who could otherwise be passed into anesthesia with comparative quiet and comfort. More comfortable, quiet and effective anesthesia is accomplished by the use of oxygen in the induction. I quite agree that the majority of patients are quite easily anesthetized and show an average susceptibility to the effect of nitrous oxid; also that there is a minority who need special consideration and technic. Dr. Henahan states that the oxygen requirement of every patient varies as does his susceptibility or resistance to the effect of nitrous oxid, and that even the same patient will show different oxygen requirements on different days. This may be true in a measure, but I doubt it is true to the extent his statement would seem to indicate. From experience and observation, I am inclined to the opinion that much of this apparent variation in susceptibility and oxygen requirement (only average patients considered) and variations in oxygen requirement of the same patient on different days is probably due to variations in the amount of air inhaled through the mouth during administration of the anesthetic. I agree that, generally speaking, the oxygen requirement is increased as anesthesia is prolonged. Dr. Henahan makes the statement that no set technic can be described which may be expected or relied on to give uniform results. We can all agree with this statement when we include all classes and types of patients. Elsewhere in his paper, Dr. Henahan says that the majority of patients are easily anesthetized and show an average susceptibility to the effect of nitrous oxid, and he presents an excellent definite procedure for administering the anesthetic to the average patient, man, woman or child. Evidently, he has found that with the proper technic (using oxygen) most, if not all, cases may be started in the same manner, and variations from the

technic be made when indicated, and when the unusual case is encountered. It is my experience that all classes of patients are better anesthetized with oxygen used in the beginning. The more gradual the induction, the better established anesthesia becomes before operation begins, and the anesthesia margin is proportionately widened. Also anesthesia symptoms appear more slowly and separately so that they are more easily observed and interpreted. The procedure suggested of using oxygen continuously until the patient becomes anesthetized, especially for anemic patients or others who are unusually susceptible to the anesthetic, is excellent. In many other cases, more particularly the resistant types, the induction might be undesirably prolonged unless the oxygen is discontinued for a time. I have found that a comfortable and satisfactory anesthesia results from administering oxygen with nitrous oxid for the first minute; after which, the oxygen is discontinued until the patient becomes anesthetized, when administration is immediately renewed. For reasons of economy in time and gas, and for shortening the duration of gas administration, a technic which is comfortable to the patient and, in the shortest time practicable, results in a well distributed anesthesia sufficiently established to be readily maintained, is the most desirable for anesthesia for our operations.

Dr. Henahan (closing): If Dr. Heidbrink and I were discussing this question informally, we should, I am sure, discover that we virtually agree on the points he has discussed. For instance, on his machine, he makes a definite setting that will positively give satisfactory anesthesia. In the great majority of cases that come to our office, that setting can be varied according to the requirements of unusual patients. The recommendations that I have made in that particular were very general, and almost any one of them would bear further discussion.

UNIFORMITY OF DENTAL LAWS*

By ALPHONSO IRWIN, D.D.S., Camden, New Jersey

THE uniformity of dental laws is (1) an international problem; (2) a national problem; (3) a state problem; awaiting solution.

The best way to ascertain in what respects dental laws are uniform, as an international proposition, would be to codify them. But it is obviously impossible to codify more than 150 dental statutes, inscribed in about twenty languages, covering more than 100 legal points, operative in about 300 commonwealths. If they were all translated into the English language and the uniform provisions in the laws were noted side by side, systematically, they could not be condensed within the compass of a large volume, much less a paper. Hence, we have outlined some of the main points of contact and make deductions therefrom.

This conclusion in regard to composition is inevitable because we have such an enormous amount of material to draw from; enough, in fact, to fill volumes the size of Polk's Dental Register of the United States and Canada. It would take more than the 430,000 words contained in the English language, and some of them would have to be repeated many times, in order to transcribe the dental laws of the world. It is also fortunate that these laws are printed in about a score of languages out of the 3,424 dialects spoken by the races of the world. The greater the number of words and languages, the more numerous are the variations in dental laws; for variations are the only uniform feature of dental acts, inscribed in different languages. Research methods seeking for uniformity reveal defects in law-construction as another stumbling block to one form of legislation. Shakespeare spoke truly when he said: "Find out the cause of this effect, or rather say, the cause of this defect, for this effect defective, comes by cause."

The underlying causes of defects need to be sought and corrected. Among such cases may be numbered defective legal technic, faulty indexing, lack of topical arrangement, incomplete provisions, ambiguity, omission of essential provisions and the introduction of unconstitutional regulations. It takes a skilful lawyer to put form into uniformity, a genius to add dental. Other defects are caused by the omission of essential requirements in sections; incomplete acts are considered in their entirety, divided authority, multiple supervision and variations in the appointment, duties and terms of dental examiners, official validation of the acts; failure to require citizenship, adequate safeguards to dental practice and uniform standards of qualifications pre-

*Read before the Section on Dental Legislation at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

dental and professional; the rules, subjects and passing averages for dental examinations; different periods for reregistrations or renewals of licenses, names, officials and places; failure to require office records, office inspection, adequate reciprocity sections, regulations for oral surgeons or stomatologists, and uniform oral hygiene acts; antiquated provisions for law enforcement, prosecutions, penalties, fines, imprisonment, revocations and disenfranchisement. There are so many underlying factors fatal to uniformity to be considered that we can outline only a few more of them, the few provisions made for recent advances in the standard of dental qualifications, as formulated by dental colleges in the United States particularly.

Different points of view constitute a formidable barrier to uniformity. For illustration: mixed boards of dental and medical or faculty members are not acceptable in this country; in fact they are illegal, as also is any connection of an examiner with dental commercial interests; neither is medical supervision acceptable. Civil and pedagogic regulation need to be kept separate. According to this opinion, it takes a dentist to put vision in supervision. It is presumed that a college member of a board of dental examiners would naturally be biased in favor of the graduates of his own college. Then there is a contest as to the respective merits of theory and practice; collegiate education and practical training; the dentist who can add a string of letters to his name and the graduate from the laboratories and operating rooms of "the University of Hard-Knocks." Dental legislation in a republic, if it is consistent, must recognize the merits of the qualifications of both classes. In the United States, we have been treated to the spectacle of a Democratic administration passing undemocratic laws, followed by a Republican administration enacting unrepublican laws. A pure democracy has no right to discriminate against dental proficiency obtained in one way in favor of proficiency obtained by another way.

This point of view is at variance with the international point of view, which many persons think overloads a dentist with scholastic education, in that it is not conducive to uniformity of dental laws.

Reduction, not production of laws, is the demand of this decade. Chauncy M. Depew has declared: "Too many laws are the curse of this country." Approximately, this demand also suggests that we take an inventory of our statutory requirements and ascertain whether a man must be a prodigy of learning or spend more than half of an active life-time in acquiring information about collateral sciences and in attaining a degree of literary culture, before he shall become qualified to practice dentistry; too often then to become a walking encyclopedia of knowledge and a pitiful dolt in a dental emergency. President Calvin Coolidge has said: "Laws are discovered, not made." Until we discover the ideal dental law or laws, uniformity is a question of the future. Literary and medical education are desirable for a dentist, but they do not constitute the most essential requisites for useful practice, and should be recognized as credentials, but not as statutory obligations. Then, the study and practice of dentistry are intensive while that of medicine is distensive. How shall we reconcile antagonistic processes? Some people say "The physician can bury his mistakes but the mis-

takes of the dentist live to testify against him." Physicians are overtaxed with legal responsibilities. Why add dental problems?

WE MUST ADD ANOTHER POINT OF VIEW

Science is opposed to uniformity. Biology's indictment of the gospel of uniformity summed up in a few words reads like this: "Mankind's possibility of growth and enrichment of body and mind have been developed under the challenge of varied conditions and varied demands. He has had to meet new situations with new adjustments. He has been kept flexible. But what will happen if the present mania for standardizing the moods and movements and minds of men succeeds in its intents? Putting dentists into a standardized medical straight jacket does not promote proficiency in practice nor uniformity of dental laws."

The acquisition of both medical and dental degrees and licenses in certain countries is necessary for uniformity of dental laws, for (1) pathologic and (2) surgical reasons, neither of which need recapitulation here; for they require voluminous consideration of social evils and infectious diseases.

International research into official sources of information confirms the fact that there is widespread regulation of the dental profession. Our investigations have girt the globe many times, resulting in the acquisition of evidence that dentists should be syphilologists as well as bacteriologists; while some dental laws forbid dentists to administer anesthetics unless a physician is present. The legislative trend toward making dentists propagandists for preventive medicine and surgery is emphatic.

There are medical laws containing dental sections, sanitary laws regulating the practice of dentistry, code laws embracing dental requirements, medicodental laws, dental laws exclusively, royal decrees concerning dentistry, edicts of kings and trade regulations of governments concerning dentists and dental surgery. We find that the practicable way to arrange laws according to the similarity of their mandates is into groups: thus, one group consists of Austria, Belgium, Finland, Hungary, Irak, Italy, Peria, Roumania and Turkey. They require the medical and dental degrees and licenses for the legal and professional practice of dentistry.

Geographically grouped into two general divisions, they consist of the laws operative in the (1) Eastern Hemisphere and (2) dental laws of the Western Hemisphere. The laws of the Eastern Hemisphere are uniform in regard to medical education and are therefore called medicodental. Statutes in the Western world form two general groups: (1) medicodental acts, and (2) dental acts. The medicodental laws of the Eastern combined with those of the Western Hemisphere outnumber the exclusively dental acts two to one. The laws to which we confine our attention are strictly governmental statutes and do not include numerous minor dental ordinances. Racial ideals govern the constituent parts of laws. The most essential provisions of dental laws which should be considered here relate to (1) validity, (2) authority, (3) function, (4) group provisions, (5) judiciary, ethic technic or legal construction, (6) uniform requirements, together with about 100 major and minor points in a dental law, which cannot be discussed to any extent within the limits of a paper.

The original reasons why dental laws were enacted are too familiar to us all to need repetition, but the recent reasons advanced are suggestive of an enlightened estimate placed on the value of dental services rendered to mankind. Why recent dental laws have been enacted is frankly stated thus. Among the number may be enumerated those of Arkansas (1921), Indiana (1917), Missouri (1917), Oklahoma (1919), Oregon (1921), Tennessee (1919), Texas (1919) and Washington (1923), which are striking: "This Act being necessary for the public peace (Ark. 1921), because the public safety requires dental laws; because the public welfare demands dental laws; because sanitation requires mouth-health; because the public health depends upon sanitation; because it is an imperative public necessity." "It is hereby declared that an emergency exists," is reiterated by each of the above named states. Attention is called to the uniform repetition of the word "adequate." Adequate dental regulation is demanded.

A review of group uniformity of dental laws in some countries begins with the Anglo-Saxon races, presenting the British Dentistry acts as models for medicodental laws, forty dental laws observing in outline the legal technic uniformly of the British acts. There are twelve substantial reasons why the British Dentistry acts are models of law construction standing out boldly in a unique class by themselves.

The Latin group of countries is typified by the dental legislation of France and Italy, each of the two countries representing divergent laws. France keeps medical education, degrees, licenses and examinations in the background; while Italy adopts them all in their law on stomatology; thus making Italian dentists eminent leaders in the stomatologic group of advocates for medical education and degrees. The Teutonic group of countries suggests Germany as a conspicuous promulgator of Teutonic ideas regarding dental regulations. "The Federal German Dental Laws constitute the laws of the several German States." "There exist no special Dental Laws of the States." The States of the Reich number forty-one. The German dental regulations are based upon expediency, common sense and practical experience, but litigation is so frequent and divers verdicts are rendered by courts in different states.

Norway, Sweden, Denmark and the Netherlands form another medicodental group. Attempts to harmonize Teutonic ideas of dental regulations with the ideas of other governments expressed in the laws operative in countries elsewhere do not succeed. Prospects for uniformity are not encouraging there.

The oriental group includes several countries with Japan as the most prominent exemplar of model dental regulations. This group includes Formosa, Korea and Kwantung, "a leased territory." Special mention should be made of Drs. Morinosuki Chiwaki, Sekuchi Enomoto and Susumu Tomiyasus' work in promoting legislation in Japan. The Japanese laws belong to the medicodental group. The 1918 amendment requires physicians to take the dental course, graduate and secure a dental license to practice, from the minister of home affairs. Japan also possesses international reciprocal relations with Belgium, France, Italy and Great Britain, which, according to one-sided representation, may be extended to Spain and nearly all the Latin-American republics. A discussion of uniformity

based upon reciprocity would require a separate paper.

Persia, which also belongs to the oriental group, has experienced a remarkable change in attitude toward the practice of dentistry. The regulations enacted since 1910 belong to the medicodental class of the ultrarestrictive type for the professional practice of dentistry. They have been amended and are now being enforced in that country. The laws show English technic in their construction. Russia or the Soviet republics union dental regulations are in doubt. Unofficial information indicates that local rules, taxes and laws are enforced and that the practice of the professions is in a deplorable condition. There are about forty political areas of the Soviet republics, with variable boundaries as well as variable regulations.

The Republic of Turkey belongs to the ultrarestrictive type of the medicodental group of countries requiring medical and dental degrees and licenses for the legal practice of dentistry. The practice of the professions is reserved for the Turks, in Turkey. The Latin-American group of republics possess medicodental regulations. They are ably represented by Argentine, Brazil, Cuba and Mexico, each republic expressing national ideals of law construction and administration, approximately uniform in their most essential requirements and stressing the necessity for medical degrees, dental degrees and licenses, as well as a literary education. Spanish standards are dominant except in Brazil, where Portugese preferences are distinctive.

The New York dental law is a model for broad and comprehensive handling of the subject, while Pennsylvania's law is a model for legal technic. The states of the United States belong to the exclusively dental law group, with the New York dental law as a model; Ohio, Pennsylvania, Massachusetts, Illinois, California, Georgia, Texas, Wisconsin exhibiting prominent types.

The decisions of the highest tribunal of a country are supreme and underlie all civil laws. Supreme Court verdicts are a prerequisite to uniformity. Such tests have almost uniformly held that dental laws were constitutional. Parts of dental laws have been targets aimed at by lawsuits instituted in the courts of the United States. Among the later verdicts, it may be cited that the Supreme Court of Michigan ruled that no power to enter into reciprocal contracts with other state boards rests with the Michigan Board of Dental Examiners. The dissent of the New Hampshire Supreme Court in 1890 in the case of the State vs. Hinman (65 N. H. 103), declaring the law was "nonconstitutional" is familiar to most American dentists and has been nullified by other state Supreme Court decisions, including a verdict of the United States Federal Supreme Court[1] and later by the State of New Hampshire, which has upheld dental laws since they have been placed in the same legal category as the medical laws.

In a case reported in *The Journal of the American Medical Association,* May 29, 1926, the Supreme Court of New Jersey sustains the medical law of New Jersey as constitutional in "Action for Penalty for Practicing without License.

1. The Supreme Court of the United States has already gone on record and refused to review state dental legislation. Court decisions are too numerous to quote by title even.

(State Board of Medical Examiners vs. Buettel [N. J.] 131 Atl. R. 89)." Hundreds of verdicts might be cited, but these are indicative of the tenor of nearly all of them in the United States. The parts of the constitution of the United States referred to in suits involved the Preamble, Article I, Section 8, Sub. 18; also Section 9, Subsection 18; Article II, Section 2, Subsection 2; Article III, Section 1, Subsections 1 and 2; Article IV, Sections 1 and 2, and Section 3, Subsection 2; Article VI, Section 2; Article IX, Section 1; Article X, rights of states, and the Fourteenth Amendment to the Constitution have been quoted in law suits.

Next to the validity of the laws, in importance, is the vested authority, which is able to enforce its will on dentists and regulate the practice of dentistry. In this connection, the "Report of the Committee (of Ten) appointed by the Lord President of the Council to inquire into the extent and gravity of the evils of dental practice by persons not qualified under the dentists' act," presented to parliament by command of his majesty, under date of 1919, is both comprehensive and edifying.[2]

This report and the related sections of the 1921-1923 dentistry acts of Great Britain's Parliament are too lengthy to quote in a paper but may be examined, on request, by anyone who is sufficiently interested in them, for they are the most illuminating summary on the subject extant, especially in regard to the vested authority.

Differences arising from divided authority are serious obstacles to the enactment of uniform dental laws. We have analysed dental laws in our possession upon this point and find that authority is vested in (1) the king or his representative, the governor or the chief executive of a government; (2) the parliament or its equivalent body; (3) a department of state such as "the ministry"; (4) departments of public welfare, home departments; (5) departments of education or public instruction governing university bodies or senates; (6) departments of registration, or licenses, or law enforcement; (7) privy councils, general and local and medical councils, boards of health or sanitation or hygiene, dental councils; (8) dental supervision specifically; (9) college faculties, medical or dental or mixed; (10) statutory boards; "high court of sessions."

All these authorities or supervisors could be reduced to numbers three, seven and eight, namely: 3, departments of state, 7, medical councils and, 8, dental councils, without impairment of any desirable prerogatives, state rights, or efficiency in the enforcement of the dental laws.

Yet, if you could assemble all these authorities, arbitrate and urge them to change their authorities or methods of supervision to the above named three kinds of bodies, each one would stoutly maintain that it is the other country which should change its words, even when they express almost identically the same idea. No one's dignity would be impaired; no state power would be abridged, and no forfeiture of authority would ensue by making dental laws uniform in regard to the authority supervising dental practice and dentists. By straining a point or two, types of authorities could be reduced to two, namely medical, and dental supervisors.

2. Compare page 45, paragraphs 180 and 181 of this report.

Kings, presidents, parliaments, privy councils and ministers of state have too many problems to solve without dispensing justice to a specialty of the healing art, concerning whose meritorious qualifications they know little or nothing. Multiple supervision is diplomatic, but does not promote justice, efficiency or uniformity of dental laws. Mixed supervision of laws creates division minus vision.

The doctrine of state sovereignty is all right in its place, but there are limitations even to the rights of states. A state's rights cease where the rights of another state begins. Exaggerated rights of states become state egotism. State egotism is inflamed popular individualism. Bloodletting is an accepted cure for individualistic and national congestions; hence, wars ensue. Famine, pestilence, horrors, orgies of all kinds, including legislative orgies, are concomitants of wars. Reflex influences stimulate dental lawmaking as well as other civil legislation. Consequently, we have many new and complex laws passed in spite of the strenuous efforts of far-sighted statesmen to check enactments. In the United States, alone, nearly 1,000,000 bills were presented for legislation to the various legislative bodies within a generation. Hence, dental legislation has been prolific.

State sovereignty is not by any means limited to the United States. Under different forms, assuming various names, sometimes wearing cunning disguises, it crops out in Mexico, Central or South America, China, Egypt or India, Irak, Japan or the Philippine Islands. The Arabs or Kurds, the Turks and Druses, the Moroccans and Riffs become permeated with an ego brainstorm, with the usual result. The model Australian states, conservative Canada, turbulent Ireland, harassed Greece, the martial Balkans, the restless Latin-American Republics and the progressive provinces of South Africa, after the fury of the sovereignty-storm has passed, find relief in legislative outbursts. Autonomy in dental as well as other legislation is demanded. The discovery is made that dentists and the practice of dentistry need different police regulations from those formerly in force in order to keep up with the progress of the age. In proportion to the stabilization reached by war-torn countries, we may expect more uniform dental laws, for governmental stability and uniformity are indispensable to each other.

Are we too optimistic if we forecast the possibility of the adoption of an international dental law based upon uniform standards of requirements and the acquisition of literary, dental and medical degrees and licenses by men of superior abilities, appearing in the future? Such an international dental law might be ratified by the more enlightened governments of the earth, authorizing any dentist who successfully meets its requirements to practice dentistry in any one of those countries which adopt such a law by written agreement.

An international certificate of qualifications could be acquired only by a person of superior intelligence, innate professional ability and financial resources, after he had pursued the prescribed courses in order to obtain the literary, dental and medical degrees through standard or recognized colleges or departments of universities. It would necessitate also the validation of three kinds of certificates; namely, an international, national and state certificate.

State certificates or dental licenses are already provided for by law, but the dental statutes are very much in need of greater uniformity in their provisions, standards and requirements, as we know. These, then, are the problems in legislation to be solved by the dental profession. One of the many advantages which would accrue as the result of the solution of the international problem would be the establishment of the solidarity of the dental profession; and thus it would be placed upon a much higher level in the estimate of the public and especially among other professions. Practical suggestions are always in order.

There should be: 1. An international and national bureau of dental laws, legislation, investigation, to obtain complete information on subjects named, so that a licensed dentist could obtain from his bureau information upon such subjects as:

(*a*) The dental laws of the various states, countries or commonwealths of the world.

(*b*) Legal decisions respecting the practice of dentistry and dental surgery.

(*c*) Laws and court verdicts regarding sanitation, roentgen-ray and oral hygiene acts.

(*d*) Laws and decisions concerning the income tax and internal revenue and narcotic acts as they concern the dentist, oral hygiene acts, municipal ordinances, military regulations, dental jurisprudence, patent laws and other laws of interest to the dentist.

2. Campaigns in behalf of enforcement of uniform dental laws.

3. Propaganda advocating more nearly uniform instead of more complex dental laws.

4. Advocacy of the adoption of uniform roentgen-ray sections in dental laws.

5. Adoption of uniform provisions in oral hygiene acts.

6. Recommendations for municipal ordinances establishing free dental clinics for the poor, based upon dental, legal and business principles.

7. The drafting of a dental patent law, which may be endorsed and submitted to legislative bodies for enactment in different nations to promote uniformity.

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DISCUSSION

Homer C. Brown, Columbus, Ohio: When we discuss the question of adequate and uniform dental laws, we are entering into a large and complicated field, since we must recognize the fact that widely separated sections of our country may place a different construction on the term adequate. Further, all medical, dental and like laws come under the common term of police regulation, and such questions as these are entirely within the control of the individual states, and arguments for states' rights are frequently appealing to legislators. Thus, serious handicaps are confronted, which may defeat, for the time being at least, any general scheme in securing uniform state laws. The tendency has been to increase the educational and legislative standards of all the professions, and rightly so. But at this time there is an awkward situation confronting the citizens of Colorado, which has for its purpose the lowering of such standards. This is an initiated legislative proposal to be voted on by the citizens of Colorado at their November election, and I am informed that the signatures necessary to the petitions in order to submit such a proposal were secured by one of the western advertising dentists. Therefore, let us hope that the best citizens of Colorado, and particularly the majority of them, will not approve of this vicious piece of legislation.

TREATMENT OF CLEFT PALATE*

By A. L. FREW, D.D.S., Dallas, Texas

MANY theories, including heredity and "maternal impressions," have been advanced as to the cause of cleft lip and cleft palate, but history shows that only a small percentage of these cases can be attributed to either cause. Since many of these cases occur among the poorer classes, malnutrition has been advanced as a possible cause, but this can scarcely be true, for nearly all of these patients at birth are healthy and normal in weight. Syphilis has been advanced as a cause, but the Wassermann test nearly always is negative.

From my records and observations, I believe this condition is largely due to mechanical conditions. I have made close inquiry into the early pregnancy history of about 350 of the more than 600 cases in which I have operated, and I find, with hardly an exception, that the mothers were unusually active during the first few weeks. Many of them worked in the fields, doing manual labor; others did large washings; some went horseback riding, played tennis and golf, went automobile riding and did various other things too strenuous for one in that condition. Of the above mentioned causes, I believe automobile riding to be the most common one, for, as you all know, there is a great amount of hard jolting attendant thereto.

The tongue, maxillary and premaxillary bones are developed and united from about the fourth to the fifth week of fetal life, the tongue developing first. I believe that overexertion has a tendency to cause a displacement of the head of the fetus and to hold the maxillary and premaxillary bones apart probably by forcing the tongue between them until such time as it is too late for union to take place.

There are few cases, regardless of age or extent of the cleft, that cannot be completely or at least partially closed by surgical procedure.

In many of the neglected or older cases in which the anterior part of the alveolar ridge cleft is wide, it is possible to close the cleft by making a greenstick break on one or both sides, thus closing the anterior part. There are cases which, if closed in this way, will give a retrusion of the maxilla, which will be very unsightly. In these cases, my method has been to close the soft palate surgically as far forward as possible, this being done by making lateral incisions along the gingiva and posterior to the tuberosities, moving this tissue to the center and retaining it by the Brophy method. An artificial denture can be constructed to close the opening which

*Read before the American Society of Oral Surgeons and Exodontists, Philadelphia, Pa., Aug. 20, 1926.

still remains in the anterior part of the hard palate. This method does away with trying to make an obturator to close the soft palate, which is never satisfactory, as it causes a great deal of irritation and cannot be worn comfortably.

We find an occasional case in which the soft palate has been operated on and has broken down, and much tissue has been destroyed. Even in these cases, it is nearly always possible to follow the method devised by Dr. Brophy, which consists of approximating the pharyngeal muscles from each side of the throat, uniting them, then severing, part way through, the muscle posterior to the suturing, and in this way extending the palate back a normal distance. We have performed several of these operations and they have been very satisfactory.

I have not mentioned cleft lip and palate in the young, for these cases are easily corrected when operation is performed at the proper age.

DISCUSSION

Arthur E. Smith, Los Angeles, Calif.: The etiologic factors of cleft palate are still debatable. The embryonal relation of the anatomic parts is known, but the cause or causes of nonunion are unknown. The principal causative factors are: malnutrition and poor hygiene, mechanical factors, overexertion, hereditary and specific infection. I agree with Dr. Frew that this abnormality may be largely due to mechanical principles; however, improper diet, poor personal and home hygiene, specific disease and constitutional derangements may be important causative factors. The fact that the tongue fills the mouth and nose at the fifth fetal week, and if the tongue fails to descend, thus preventing the various embryologic processes from uniting, this would seem to favor the theory that pressure against the fetal head caused by some mechanical influence is an important etiologic factor. I believe that the number of cleft palate cases can be greatly lowered by the education of the expectant mother in proper hygiene and diet. She should take well regulated moderate exercise daily, which will improve the circulation of the blood, appetite and digestion, augment elimination and stimulate restful sleep. An expectant mother should not become fatigued. The intensity of fatigue increases as the day of confinement approaches. Daily deep breathing and moderate walking in the sunlight is highly beneficial. Exercise causing violent exertion must be avoided, such as: strenuous labor, running, bicycle riding, golfing, tennis, swimming and skating. Driving an automobile is forbidden, and only short motor rides over smooth roads should be taken. Faulty nutrition and disease of the mother during pregnancy are no doubt important etiologic factors. The disease may not be syphilitic, but some other constitutional disease which may arise from focal infection, poor hygiene and improper diet. The personal history of the mother of a child having a cleft palate invariably shows extreme ignorance in regard to personal hygiene, home hygiene and intelligence regarding diet for herself and family. I agree that overexertion of the mother would have a tendency to cause displacement of the head of the fetus, thus forcing the tongue between the maxillary and premaxillary bones, preventing normal union. I would not place all the blame on the automobile, as cleft palate was as prevalent before the advent of motor cars as it is today. One of the most important mechanical causes of cleft palate is sexual intercourse, causing displacement during early pregnancy. Mechanical interference and overexertion may injure the aminotic sac, or cause deficiency in the liquor amnii, which may cause amniotic adhesions, preventing perfect development of the fetus. From my own records and observations, I do not believe that any one thing is responsible for this embryologic defect. I believe that the contributing factors are of importance in the following order: (1) mechanical interference and overexertion; (2) improper diet and poor personal and home hygiene; (3) specific disease and constitutional derangements. Dr. Frew is correct in stating that practically all cases, regardless of age, and extent of the cleft, can be closed with surgical procedure. I wish to emphasize that cases are extremely

rare in which the cleft cannot be closed by a skilful plastic operation. With the older or neglected case, the soft palate can be reconstructed by the Brophy method, which utilizes the pharyngeal muscles; or by the von Langenbeck operation. The closing of the cleft anteriorly in a neglected case may be satisfactorily accomplished, if the cleft is not too wide, by a greenstick fracture. Retrusion of the maxilla may result. The closing of the cleft by surgery is always preferable to the use of an obturator or plate. The clefts are indeed few which cannot be closed by utilizing flaps from the palate tissues or from the nasal septum, the floor of the nose, cheek or gums, or from an extra-oral pedicled flap from the neck. A skin graft from the abdomen or leg can be employed. I operated in a case of this character using the thumb as the intermediary agent. After the thumb and skin over the anterior part of the thigh was denuded of surface epithelium, the thumb was sutured to the skin of the thigh, and the parts were placed in a plaster cast. Later, the skin flap was removed from the thigh, and attached to the thumb, which insured the blood supply. The flap was then sutured into the cleft, and when the blood supply between the flap and palate tissues was established, the flap was released from the thumb, the skin flap bringing the cleft. The skin graft soon assumed the color, texture and function of mucous membrane.

THE RELATION OF DEEP-SEATED CARIES TO PULP CANAL INVOLVEMENT*

By ELMER S. BEST, D.D.S., Minneapolis, Minnesota

IN studying the pulpless tooth question, some years ago I became impressed with the fact that the solution of the question lay primarily in a refinement of our diagnosis just as much as in the perfecting of a root-canal operation. While the latter offered a big field for development owing to the conditions continually revealed by the roentgen-ray, it was exceedingly apparent that some means must be employed to solve the problem of teeth having extensive caries in some other way than by pulp removal. This was revealed, when, after an extensive study of a large number of cases, it was found that the great majority of teeth had lost their pulps because of the presence of deep-seated caries. Experience had taught dentists that it was highly unsatisfactory to place fillings in such teeth as pulpitis frequently followed which would necessitate the removal of the pulp. Hence, the pulps were removed before placing the filling.

Two avenues were open at that time as a solution of the problem of the disposition of the dental pulp in the case of deep-seated caries. They were pulp-capping, as a cure, and oral prophylaxis as a preventive. A review of the literature on pulp-capping gave but slight encouragement, as it was found that the majority of writers had but slight confidence in it. Volumes have been written on the prevention of caries, and while some progress may have been made as far as the general public is concerned, it is going to take a long

*Read before the Section on Operative Dentistry at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

time to so educate the people that those who seek the services of their dentist will do so before caries has advanced to the point where the pulp is threatened, if not actually involved.

A deep study of the subject, therefore, left the conviction that some means other than that commonly employed must be developed to handle the situation. Radiographic study of teeth with caries revealed the fact that, in most cases, nature had made a big effort to combat the advancing processes by laying down secondary dentin in varying degrees of thickness. In view of the fact that secondary dentin was present in the teeth of most adults, its formation did not seem to have any particularly deleterious effects, from the standpoint of the pathologic process involved.

I have long been convinced that one of the reasons for the failure of root-canal operations lay in a lack of thoroughness and a lack of asepsis. Was it not possible that the same factors existed where attempts have been made to save pulps in a vital condition? A series of cases were run through for observation and the results checked carefully. Only those cases were selected in which ordinarily the pulp would have been removed or the tooth extracted because of the extent of the caries. The vitality of the pulp having been determined, the rubber dam was applied and the over-hanging enamel chipped away. With curets, the carious dentin was cautiously removed. Because of previous unsatisfactory experience in pulp capping, precaution was taken to prevent exposure of the pulp. At first, the value of this precaution was not demonstrated, but I am now convinced that it is one of the most important steps in the operation.

After all of the carious dentin is removed from the side walls of the cavity, the pulpal and axial walls are attacked. With good vision and access, this dentin is cautiously removed and the cavity well cleaned but the pulp not exposed, even though a thin layer of involved dentin is all that prevents its exposure. It is thoroughly irrigated with a warmed surgical solution of chlorinated soda. This mopping or sponging process should be kept up for ten or fifteen minutes. The cavity is then dried and a mixture composed of zinc, magnesia, silver nitrate powder and eugenol is brought to a fairly thick consistency and a drop placed in the base of the cavity with a fine probe. With a small, dry pellet of cotton, the mixture is gently spread over the floor, and excavators are used to trim it away from the margins. Particular attention must be paid to its removal from the gingival margin. While the material contains silver nitrate, if due precaution is taken to keep it away from the margins, no discoloration will be apparent.

The next step is to cover the mixture with oxychlorid of zinc cement. Oxychlorid is used for the reason that it is one of the very few cements through which moisture will not pass. After the oxychlorid of zinc is put to place, the cavity is filled with oxyphosphate cement, and the occlusion is tested with carbon paper and relieved. The tooth is given a period of rest. If no symptoms contraindicate the procedure, the permanent restoration is put to place in a few weeks.

This operation does not lend itself to a careless or indifferent technic, but must be carried out with the closest attention to detail. The results observed in the series of cases referred to were

astounding. Pulps for which but little hope could be held out were found to retain their vitality, and an absence of unfavorable symptoms together with encouraging radiographic evidence seemed to indicate success. Further observations justified a feeling of optimism, and after considerable time, the operation was adopted as practical. It is here offered as a contribution to modern preventive dentistry.

One hesitates to carry the advocating of an operation into questionable fields, but viewing as I do, with the greatest concern, the removal of a vital pulp, I cannot refrain from mentioning some of my experiences in cases of a more deeply involved nature. Many cases were found in which, on the removal of the carious dentin, a small drop of pus welled up into the cavity. In these cases the pulp chamber was opened at this point in order to give free access to the area of suppuration. Frequently, it was found that only a slight area on the periphery of the pulp was involved. In such cases, the area was extensively irrigated with warmed surgical solution of chlorinated soda. After such irrigating, the cavity was dried, the mixture above referred to was applied and the cavity was filled as outlined above. In twenty-four or forty-eight hours, this was removed, and if any suppuration was present, it was again irrigated and sealed in the same manner.

In opening the cavity containing this substance for exploratory purposes, great care must be taken in not forcing it or cement into the cavity. This is accomplished when approaching the base of the cavity by cautiously chipping out the material used and irrigating the cavity with a fine, curved needle. When no further suppuration is present, the cavity is sealed as first described and the occlusion relieved.

In considering the subject of pulps of teeth and what we should do along the line of root-canal operations, I have made a determined effort to follow principles of practice that were sound and would not have to be changed. It is foolish to class all root-canal work under one group and either condemn or O. K. the procedure. We must consider: 1. The removal of vital pulps: (a) because of deep caries; (b) to provide a means of getting anchorage; (c) because of accidents. 2. The removal of dead pulps: (a) where the entire pulp is diseased and there is apical involvement; (b) where the entire pulp is diseased and apical tissues are intact radiographically; (c) where only a portion of the pulp is involved. 3. Teeth which contain root-canal fillings when they first come under our observation.

REMOVAL OF VITAL PULPS

Considering the group in which we deal with vital pulps, it has been my observation that it is an extremely rare occasion when it is necessary to remove a vital pulp because of extensive caries, though in the past this has been the most frequent cause.

In the group in which pulps are removed to provide anchorage, the solution lies in the use of restorations of which there is now a wide range, which do not call for the removal of pulps.

Accidents comprise the class of cases against which no provision can be made. They are bound to happen, and when they do happen, we must be prepared to handle the situation, being as careful as possible to maintain aseptic conditions, and remove the pulp, severing it as nearly as possible at the junction of the

cementum and dentin, because it is at this junction that the pulpal tissue begins. In the apical foramina, the tissue is the pericemental membrane and contains the cementoblasts on which we depend for the closing of the foramina.

After the pulp is removed, always under conductive anesthesia, not pressure or by the use of arsenic, a mild dressing of surgical solution of chlorinated soda should be used, following a careful irrigation and cleansing to remove blood clots and tissue fragments. Under no conditions should caustic, tissue destroying drugs be used in these cases.

When the apical tissue has healed, the canal should be filled in the best possible manner. For this purpose, I have, on occasions, used oxychlorid of zinc cement with the greatest satisfaction. The cement must be mixed in the canal, in this way: With the canal ready for filling, a paper point is placed in it. Then a drop of the cement liquid is placed around the paper point, which is slowly withdrawn, drawing the liquid up into the canal. More liquid is used until the canal is filled. Then a smooth broach or file is moistened slightly in the liquid on a cement slab, and drawn through the powder of the cement. This is carried into the canal and stirred into the liquid. This is kept up until the mix is sufficiently thick. Then a small pellet of cotton is placed over the opening of the canal and the cement condensed with a canal plugger.

REMOVAL OF DEAD PULPS

The Removal of Dead Pulps with Apical Involvement.—No treatment through the root canal is indicated for periapical infection. The satisfactory healing of a diseased process around a root end is dependent on the vitality of the cementoblasts, and this cannot be determined by the roentgen ray or by any other means that I am familiar with and that I would care to try out on my patients or recommend for others. Therefore, I am of the firm conviction that diseased periapical tissue should be removed surgically, by extraction or apicoectomy.

The Removal of Diseased Pulps with No Periapical Involvement.—This class constitutes a dangerous group to handle, and in case we wish to save them, we must depend on powerful germicidal dressings and trust to luck to their effect on apical tissues. In all cases in which teeth are retained that have had diseased pulps, the silver nitrate treatment advocated by Percy R. Howe should precede the filling of the canal.

Cases in Which Only a Portion of the Pulp Tissue Is Destroyed.—In these cases, the canal should be carefully irrigated with surgical solution of chlorinated soda and fibers of pulpal tissue removed. Dressings saturated with the solution are used in cases not too far advanced and an effort is made to retain the tissue at the apex, in a vital condition.

OLD ROOT-CANAL OPERATIONS

When old root-canal fillings are present, we must be guided by our judgment as to whether we can better the condition (1) by opening and using silver nitrate and filling; (2) by leaving them as they are; (3) by extracting. In these cases, my attitude is the same as regards apical infection as in Class 2.

From evidence already gathered, it may be found that, in and around teeth with carious cavities, and where the pericementum is involved with periclasia, we may have to record the same bacteriologic findings that have been published in connection with pulpless teeth. If

such a condition should develop and were we to adopt the policy that all pulpless teeth should be extracted because of bacteriologic findings, what solution other than extraction can be found for such teeth; and if such should be the case, where will dentistry stand when an estimate is made of its development?

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DISCUSSION

M. H. Garvin, Winnipeg, Canada: Dr. Best has well emphasized the importance of diagnosis, for on this depends "all the law and the prophets," as far as the pulp canal problem is concerned. While convinced that the solution of this question lies in prevention, and while believing that the day is not far distant when the majority of careful people will see the importance of regular dental examination and prophylaxis, we shall always have the problem of deep-seated caries and the pulpless tooth to deal with. Dr. Best offers a real solution for our difficulty and one that should receive the thoughtful consideration of every dental practitioner. The technic is above criticism although some judgment would seem to be necessary in determining just how much involved dentin may be safely left in a cavity. We have had no experience in treating conservatively those cases with a pulpal abscess but have used a silver nitrate paste considerably in less involved cases and can support Dr. Best's enthusiasm for it as far as we have gone. We usually favor giving a longer period of rest than a few weeks even though no symptoms contraindicate proceeding with the permanent restoration. In regard to root-canal operations, reference might be made to the problem of removing vital pulps in case of accident, and in fact to the removal of pulps in general. Until more definite scientific research has been carried out in this field, we are convinced that the history of the patient should be given serious consideration. In those patients with a good family and personal history, the procedure outlined in this paper is to be highly commended. In those patients with a good family history but a poor personal history, that is, having acquired a susceptibility to infection, root-canal operations should be considered questionable after 40 years of age. In patients with a bad family history, extraction should be preferred to root-canal operations. We are indebted to Weston A. Price for this suggestion of the grouping of patients and we have found it a very practical way of dealing with this problem. We largely agree with Dr. Best that, as a rule, diseased periapical tissue should be removed surgically, by extraction or apicoectomy. In patients in whom root-canal operations are justifiable, apicoectomy is justifiable. In nearly 800 cases so treated in which we filled the apices with amalgam, we have found that a large percentage of these cases present a condition which justifies this procedure in selected cases.

Thomas B. Hartzell, Minneapolis, Minn.: In these days, when so many men in our profession have jumped to the conclusion that infected and diseased teeth must all be removed from the jaws, to find a man who has the courage to attempt conservation and who has thoughtfully striven to improve methods of treatment is to me a matter for congratulation. The dental pulp obeys the same physiologic laws as do the other tissues of the body. As long as the circulating blood is moving freely in and out of the pulp chamber, the methods advocated by Dr. Best succeed. His treatment here outlined is intended for that type of case in which the circulation has not been so disturbed as to make it impossible for the pulp by natural physiologic processes to repair itself. I have, in my long experience, seen pulps that were exposed and bleeding (which is the condition with which Dr. Best has not attempted to deal) made comfortable and maintain their vitality for a period of years, without pain or discomfort or evidence of infection. I have had, in my own experience, a considerable group of cases, treated in the manner advocated by Dr. Best, and the pulps of these teeth so protected are sensitive to heat and cold, although not unduly sensitive or abnormally sensitive, in use. Radiographically, the bone of the socket appears to be normal, presenting no evidence of physical change.

INVESTIGATIONS OF DENTAL CARIES*

By PERCY R. HOWE, D.D.S., Boston, Massachusetts

IMPROVEMENT in laboratory technic has given to modern investigation advantages which were denied to earlier research. Notwithstanding this fact, bacteriologic studies have added little to previous disclosures on caries.

It is true that aciduric bacteria are found in cavities and that we differentiate them more clearly, yet we have no greater insight into their mode of action. Though we grant, for the sake of argument, that they may produce a sufficient amount of acid to dissolve the mineral constituents of the teeth, we are still faced with the problem of immunity. Now the word "immunity" is often loosely used. Immunity in the blood stream is produced by definite serologic reactions in response to bacterial stimuli. But the aciduric bacteria elicit no serologic responses. Hence, immunity to caries, from the bacteriologic standpoint, means nothing more than resistance to acid decalcification. That such resistance must be great is evidenced by the freedom from caries of whole races, such as the Arab and the Bulgarian, who live largely on soured milk. Miller himself calls attention to the food of swine, which is fermentative to an unusual degree, without resultant caries. Even the teeth of experimental animals fed a combination of sugars and aciduric bacteria are able to resist decay.

Acting on the theory that an artificial immunity to acid decalcification may be achieved by the reduction of fermentable residues in the mouth and the partial elimination of bacterial flora, we have advocated a smaller consumption of carbohydrates and multiplied our cleansing processes. We know that the results have been negligible.

From an experimental standpoint, the most significant effects on the teeth have resulted from abnormal or deficient feeding. These have ranged from defective structure in rats and dogs, to caries in guinea-pigs and monkeys. The study of dietary effects reveals the possibility that caries is a far more complicated process than a simple decalcification by acid.

It has long been held by adherents of the fermentative theory that the hyaline area invariably associated with the caries of living teeth is formed as a barrier to further bacterial encroachment. We have then a tacit admission that the pulp takes an active part in the defense of the tooth against caries, even though the stimulus comes entirely from the outside. In the majority of cases this defensive action (if such it be) is ineffectual, yet it is not uncommon to find a hard flooring of calcified material laid down in the cavity, with the

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result that caries is arrested. Miller reports the cases of two children whose "unfilled cavities healed completely, the dentin became hard and smooth, and no further loss of substance occurred." The pulp presides over the calcification of the forming tooth. I hope to show that there is no cessation of its activities throughout its life; that by its action, calcified teeth may soften, and that by a reversal of the process there may occur recalcification.

A number of recent investigators have shown that the pulps of the teeth are extremely sensitive to nutritional faults. It has been definitely shown that at least one food factor, by its presence or absence, may influence the odontoblasts, either to form or to resorb dentin. I refer to the antiscorbutic vitamin, deprivation of which causes the odontoblasts to show demonstrable changes in the guinea-pig, in from five to seven days. When the missing factor is supplied, dentin formation may be observed in twenty-four hours. In absolute scorbutus, the pulp was shrunken and completely freed from the dentin and apparently floating in a liquid material. Examination at twenty-four and forty-eight hour intervals after the addition of orange juice to the diet showed that the filling of the space by dentin proceeded from the surface of the odontoblasts outward. The rapidity of its formation and its appearance before any discernible restoration of the odontoblasts to normal size and staining reactions indicate that the process is one of setting or jellying of a liquid material.

The other vitamins which have been regarded as important to calcification are the antirachitic and the fat soluble A. Mrs. Mellanby has shown that the presence of the antirachitic causes the formation of excellent teeth in dogs. Wilson's examination of the bones of young children in New York casts doubt on its value for human beings. As to the fat soluble A, Dr. Wolbach and I found only minor defects in the teeth of rats on a diet deficient in this factor.

The importance of the vitamins to dental health lies in their capacity to cause the fixation of lime. But in the field of inorganic metabolism, there is much confusion, and animal experimentation has not harmonized conflicting opinions. Whether we stress the deficiency of lime in modern diets, or the proportion that it should maintain with phosphorus, or its assimilability according to the character of the foods from which it is to be absorbed, we find support among some investigators, and negation among others.

Analysis in our laboratories shows a decided increase in the proportion of magnesium to calcium in carious, as compared with sound, teeth. Without attempting to explain the metabolic process by which such a substitution occurs, we would emphasize the importance of the fact to a vitalistic theory of decay. The metabasis could have been affected only through the activity of the pulp.

In order to ascertain how promptly substances reach the teeth from the digestive tract, guinea-pigs were fed salts of the following metals: iron, copper, lead and zinc. These were all found in the pulp thirty minutes after administration, and in the dentin after twenty-four hours. Determinations were made by both chemical and spectrum analysis. That metals act in a similar fashion in human beings may be seen by the examination of teeth from persons suffer-

ing from lead poisoning. The teeth of two such cases, examined by us, showed the presence of lead in the dentin, in the interglobular spaces and in the enamel tufts. The determinations were made in the same manner as for the experimental animals. In addition, sections stained with ammonium sulphid disclosed black areas containing lead. Similarly, Aub has shown that the calcium of bone may be replaced by lead, and has produced rapid caries in cats by feeding them lead acetate.

Having seen that foreign bodies of a harmful nature may be thus easily transported to the teeth with pronounced deleterious effects, we can more readily consider the possibility that unsuitable metabolites play their part in the undoing of sound tooth structure.

Decay of the teeth of animals during experimental feeding has occurred in our laboratory under varying conditions. Its onset and progression have not always been so certain and rapid as we had expected. The number of factors involved in providing the most simplified diet have made it impossible to draw precise conclusions as to the effect of any one factor, with the single exception of the antiscorbutic vitamin.

Yet the following observations seem to us significant: that the most rapid and pronounced caries in monkeys has occurred when the diet has been largely composed of gelatin and cereals; that a deficiency of the antiscorbutic factor has played a part in the production of caries; that excess of sugars and starches has not resulted in caries within the allotted time of the experiment, or nine months; that monkeys fed a milk, vegetable and fruit diet have excellent teeth.

The characteristics of the gelatin and cereal diet which, with our present incomplete knowledge of foods, seem most likely to be responsible for dental deterioration are the high content of protein, paucity of mineral elements and vitamins, lack of bulk and extreme acidity of the ash. Milk, vegetables and fruits contrast favorably in all these respects. The protein is low, the lime abundant and the ash basic. The dilution of the food elements by water and cellulose insures a less concentrated, more easily assimilable supply of nutrient material. There is no flooding of the system with harmful metabolites which it may be difficult to eliminate. We believe that such a diet preserves the healthful activity of the pulp, and enables it to maintain that intimate union of the organic and inorganic components of the tooth which constitutes an impregnable structure, and assures us immunity to decay.

ELECTROTHERAPY IN PERIODONTAL DISEASE AND ROOT-CANAL STERILIZATION*

By ERNEST STURRIDGE, D.D.S., L.D.S., R.C.S.E., London, England

THE term periodontal disease is here used in the broad sense, including all the morbid changes which take place in the gingiva, pericementum and alveolar process, from the very early stages when but a slight gingivitis is observed, to slight deepening of the gingival trough and formation of a shallow pocket in which food débris, salivary calculus, bacteria, etc., collect and, as a consequence, inflammation and septic infection of the tissues develop. Succeeding this, there is a sequence of more severe morbid changes, which take place in the deeper tissues as the disease advances, leading to progressive loosening and, finally, loss of the tooth.

Regarding the etiology, it is generally accepted that no single factor is solely responsible for causation of the disease, and many hypotheses have been propounded in which it has been sought to attribute definite groups of factors to the true etiology. None of these theories, however, have been finally accepted. One factor in every grouping is always included and universally accepted, and that is that the bacteria are associated with it secondarily. There is no question of the disease being caused by a single specific organism. The pyogenic micro-organism preponderating is generally of the streptococcal type.

It is especially desired to bring to your notice the part played by micro-organisms in the early stages of periodontal disease and to emphasize that, at the very beginning, when no one would diagnose it as pyorrhea and many look on it as a "simple gingivitis," bacteria play a very important part in the progress of the disease, and treatment must be aimed at sterilization and stimulation of the tissues, with the intention of aiding metabolism and placing the tissues in a state to resist reinfection. Prophylaxis alone is not sufficient to eradicate the action of bacteria which enter the tissues; nor should it be left entirely to the resistance of the tissues themselves to overcome this factor. It is with this ever-present secondary etiologic factor that electrotherapy is intended to deal.

A general survey of the present position of electrotherapy in medicine points to a history of advancement during the last twenty years unequaled by any other branch of medicine. In dentistry, there is not so much scope for this method of treatment, but appreciable

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advancement has been made in the knowledge and use of electrical energy in dealing with certain septic infections of soft tissues and pulpless teeth.

Great strides have been made in knowledge of the action of the current by the study of the physiologic and biologic effects of electrical energy as a curative agent.

The stimulating effect and heat produced are by no means negligible therapeutic agencies.

The appearance of the white line on the gingival margin when ionized with zinc chlorid is an indication of coagulation of albumin in the tissues. This property is in itself beneficial in treating septic surfaces by fixation of microorganisms in the tissues and reducing absorption of septic products.

It is unnecessary to enter into details of technic of electrotherapy. Let us consider reasons for adopting it and in what way it is useful in treating periodontal disease. It should be remembered that the periodontal tissue is a subepithelial tissue and that infection of that tissue takes place only through a lesion in the epithelial lining of the gingival trough. The epithelial layer of the normal gingival trough at eruption of the tooth is in absolute continuous union with Nasmyth's membrane, and, according to Gottlieb, as eruption continues, it is still in union with the cemento-enamel junction, and finally the cemental neck of the tooth is exposed and proliferation of epithelium takes place in the periodontal membrane. The epithelium is Nature's first line of defense against septic infection of the subepithelial tissues. No healing of a wound in any part of the body takes place until the breach in the epithelial covering is restored. This applies also to the gingival trough. We have to consider the best means of restoring the lesion which occurs in the gingival trough due to sloughing of the epithelial lining. Does instrumentation, correcting occlusal stress, hygienic cleansing, etc., accomplish this in a satisfactory way? Is it to be expected that organisms which infect the microscopic layer of serum and leukocytes in the gingival trough and have invaded the subepithelial tissues will readily relinquish their hold on the tissues without direct sterilization? The disease is essentially inflammatory in character, and bacteria are known to infect the tissues when in this state. This factor should be vigorously dealt with in conjunction with all other mechanical irritant causes.

It has been computed, and rightly so, that chemicotherapy of gingival affections is a failure on account of the impossibility of applying strong enough antiseptics without injury to the tissues or poisoning of the general system, and also the necessity of frequent application in order that antiseptics may be at all effective.

Electrosterilization of the gingival trough with zinc, copper or iodin ions in conjunction with thorough instrumentation and attention to every local etiologic factor has been my constant practice for many years, and, clinically, this therapy has proved highly satisfactory.

When a current of 3 or 4 ma. is passed into the periodontal tissues, with a metallic electrode of small diameter or cross-section, the density of current at the point of contact is very great and the electrolytic action is correspondingly great. With zinc chlorid as the liquid electrolyte, and the electrode

placed on the gingival trough, zinc ions permeate the contents of the space, which, in disease, contains escaped leukocytes, serum, desquamated epithelium, bacteria, etc., and pass into the epithelial and subepithelial tissue cells. There is a certain amount of coagulation of albumin in the tissue, and bacteria which are albuminous in character are "fixed" and destroyed. From the zinc chlorid, a certain amount of free chlorid is eliminated. This in itself is a powerful germicide. There is also the stimulating effect of the current. Cell protoplasm is exceedingly sensitive to thermal changes and reacts in a pronounced way to chemical and physical stimuli. The ions in the tissue cells are set in motion by the passing current which they conduct through the body, and this is a stimulant that can readily affect tissue metabolism.

The placing of an antiseptic barrier between the septic trough and the inflamed tissues enables the latter to recover.

The nutrition of the tissues is improved by (*a*) the diminution of irritation from sepsis due to the antiseptic action of the zinc ionization and (*b*) the exchange of ions between the fluids and cells in the tissues due to the passage of the current. Inflammation rapidly subsides and the gingival trough becomes once more healthy and able to resist reinfection.

It must not be understood that this therapy runs a smooth course in every case of periodontal disease. There are often constitutional pathologic conditions present which influence general tissue repair and hamper local treatment of any part of the body, but generally it is a means of aiding regeneration of the tissues. Nature aids when it is possible and, by a reduction of sepsis, local metabolism is enhanced.

From a clinical standpoint, I have recorded a large number of cases in which it is perfectly evident that the disease has been cured, and I attribute the success to reduction of sepsis by ionization of the tissues in conjunction with removing other etiologic factors. Resistance against reinfection is due to normal restoration of the epithelial continuity of the gingival trough and cooperation of the patient in effective daily hygiene.

In cases in which occlusal stress is the particular predominating factor, no results can be expected by ionization of the tissues without reducing the occlusal defect. Occlusal stress produces a chronic progressive pericementitis and rarefying osteitis, and establishes proliferative pathologic changes in all the tissues surrounding the root of the affected tooth. The gingival trough is deepened by absorption of the alveolar crest and shares in the general inflammatory condition. Relieving occlusal stress is not in itself sufficient to restore the parts to health. Infection of the gingival tissues is always present, and treatment of this factor by direct sterilization is a great help in promoting tissue regeneration.

The most effective electrolytic solution in my experience is zinc chlorid.

ULTRAVIOLET RAYS

This paper would be incomplete without reference to ultraviolet ray therapy as a curative agent in periodontal disease. The precise action of the rays on the tissues is not yet fully understood. Experimental and clinical evidence by workers in this sphere of electrotherapeutics points to the value of the actinic ray as a curative agent.

The erythemia produced by the quartz-light applicator is probably the only therapeutic effect of value that can be scientifically claimed by this method of treatment. This reaction on the tissues includes all the phenomena of nutrition and cell growth.

Springer and Tardieu,[1] of Paris, experimenting on rabbits with ultraviolet rays, conclude that there are two main factors which may explain how ultraviolet radiation acts. One is the osmotic pressure, which regulates the amount of penetration into the body cells of the molecules, whose fixation represents the degree of growth activity. The other is the production of intra-organic electricity. All the factors which increase the production of organic electricity increase the phenomena of nutrition. Ultraviolet rays appear to have the effect of producing ozone and thus promoting tissue oxidation.

Other theories of the action of ultraviolet rays are more or less summarized in the foregoing. The theory that bacteria are destroyed by ultraviolet radiation, must as far as pyorrhea pockets are concerned, be considered as a reactionary effect dependent on tissue metabolism, and not as direct sterilization, because the rays cannot penetrate to the depth of the gingival trough. Medical authorities agree that penetration of the rays is not more than 2 or 3 mm. below the surface of the body. The destruction of bacteria in the body is secondary and dependent on the reaction of the tissues themselves.

Clinical evidence of the therapeutic value of ultraviolet radiation in pyorrhea treatment is increasing, and many workers have recorded their experience with this therapy, among others, W. T. Bovie of Harvard University, who claims remarkable results with the quartz light. His technic indicates that erythemia is the effect obtained, and indirect action on the organisms, and not direct sterilization of the gingival trough, which is beyond the range of penetration of the rays. William Dunn, of Florence, and A. E. Rowlett, of England, and many others record excellent results from the arc-light lamp, using long exposures by which mild erythemia is produced. The technic of all these indicates tissue reaction rather than sterilization effects, and in this respect differs from electrosterilization of the gingival trough by ionic medication.

1. Springer, M., and Tardieu, A.: Bull. Acad, de méd., 95: 394-398 (April 20), 1926.

ROOT CANAL STERILIZATION

Electrotherapy for root canal sterilization is now almost universally considered the most effective method of dealing with this difficult and important problem.

Absolute sterility of the canal and dentinal tubules of the devitalized root is what is desired, and this is met by many difficulties owing to the inorganic structure of the parts, the facilities for retention and growth of bacteria and the absence of living tissue to exercise combative and reparative powers found elsewhere.

Chemicotherapy has failed to have the desired effect of sterilizing septic root canals, even with the most powerful antiseptics.

At the present time, many of those who are most thorough and successful in root-canal cases, after exhaustive tests of many other methods have finally concluded that electrosterilization is the most scientific and effective

means of dealing with the bacteria present.

Antiseptic efficacy of certain ions rests on (1) theoretical considerations; (2) laboratory experiments *in vitro* and (3) clinical experience. From the standpoint of these factors, let us examine the claim, which I have no hesitation in maintaining, that zinc ions from zinc chlorid are highly antiseptic and effective as the electrolytic solution in root-canal sterilization.

Theoretical Considerations.—It is undisputed that zinc ions travel in the direction of the current from the positive pole. Zinc ions coagulate albumin and cause death to living cells, and bacteria (which are mainly albuminous) are also destroyed. At the same time, zinc ions do not irritate contiguous tissues. Professor Leduc[2] says, "This ion is an antiseptic of first rank. There is no wound or ulcer which cannot be disinfected by its employment." Friel[3] says, "In ionization with zinc, the exudation and germs are penetrated and permeated with zinc. They are 'fixed' and this fixation involves the death of the germs." Morphey[4] says, "The coagulation power of zinc ions on albumin is well known, and I have suggested previously that one way in which this may be of benefit in the treatment of periodontal disease is by the sterilization and sealing of the suppurating surface."

Experimental Evidence.—It is unnecessary to quote experimental evidence of the coagulating properties of zinc ions on albumin. Leduc, Friel, Lewis Jones and I,[5] and others, have shown that this effect occurs at the anode with a weak current.

Experimental evidence of a conclusive nature is furnished by Friel[6] to prove that zinc ions are antiseptic, as follows:—Staphylococci are mixed in large numbers with freshly drawn blood and the mixture is divided into two portions (*c*); one is placed so as to be in contact with zinc gelatin (*d*), and the other with salt gelatin (*b*). The latter serves as a control. The current takes zinc ions from the zinc gelatin and deposits them in one portion of the blood, but these do not reach the second, as a column of salt gelatin (*a*) intervenes, with the result that when each is plated out, the former proves to be sterile, while the latter gives a good growth.

This experiment I have carried out with the assistance of Dr. Friel, who supplied the apparatus and gelatin, with the same result.

A similar experiment by Friel on the liver of a rabbit which was inoculated with *B. perfringens* by intravenous injection of a culture during life is detailed in his book, but zinc sulphate was the electrolyte. The result was sterility of the portion of zinc ions and copious growth in the other.

Experimental evidence of the penetration of ions into the dentinal tubules is furnished by the following experiment, which is carried out under conditions as nearly resembling the natural state as possible: Remove the pulp from a freshly extracted tooth by ordinary cleansing methods as is done in the mouth to the apex, but without unduly

2. Leduc: Lesions in Medicine, Arch. d' Elect Med., Sept. 25, 1904.

3. Friel: Electric Ionization, p. 64.

4. Morphey: Brit. Dent. J., March 15, 1926.

5. Sturridge, Ernest: Dental Electro-Therapeutics.

6. Friel: Electric Ionization, p. 60.

enlarging the apical foramen. Fill the canal with 5 per cent solution ferrous sulphate, and insert a fine nerve broach to the apex and some cotton saturated with the solution in the pulp chamber (*a*). Suspend it in a U-shaped glass tube which is half filled with fresh egg albumin and saline solution (*b*), so that the albumin reaches to the level of the neck of the tooth. Attach the positive pole to this and, in the other end of the tube, insert in the albumin a platinum electrode (*c*) attached to the negative pole, passing 5 ma. for ten minutes. Remove the electrode and wash thoroughly in tap water. Place the tooth in 10 per cent potassium ferrocyanid for twelve hours, then grind it longitudinally to the pulp chamber and steep it for twelve hours longer in the same solution. The ferrous ions colored blue can be seen in the tubules.

In the living subject, the current diffusion is in all directions of conduction and the ions in all directions where there is organic matter; i.e., through the dentinal tubules and the apical foramen. We may reasonably expect penetration of ions deep in the tubules, fixation of bacteria and sterilization by this means.

The current strength and time necessary to accomplish electrosterilization has been admirably explained by Prinz, who gives Zierler credit for discovering the interrelationship of the factors and has established the constant 30 as a correct basis as follows $\frac{30}{\text{ma.}} = \text{T}$; i.e., if 5 ma. is tolerated, six minutes will be required; if 3 ma., ten minutes, and so on. No harm can be done in zinc ionization by extending the time, and in apical infection, it is desirable.

Bacteriologic tests of the contents of the canal have been made after ionization, and it has been shown possible to completely sterilize the canal by this therapy.

Clinical Experience.—There is abundant clinical evidence published from time to time of the efficacy of electrosterilization of root canals. The method is becoming more standardized and definitely established. In my experience, if the canal can be thoroughly ionized under septic conditions before inserting the root filling, reinfection of the apical tissues is eliminated. Apical areas can be treated through the foramen and cured and regeneration of bone induced.

The therapy includes a great deal of careful mechanical manipulation, chemical and therapeutical applications. The root canal must be cleansed of every partical of organic matter; which may be aided by the use of acids in the removal of obstructions. The acid must be subsequently neutralized. Ionization accomplishes the sterilization, which is the key to success of a good root filling.

When iodin is the electrolyte used, the ions which pass into the apical tissues are readily absorbed into the general circulation, and however antiseptic they may be, it is doubtful that the effect is lasting enough to be as germicidal as ions of the heavy metals. The stimulating effect may be of value, but there is no coagulating of albumin as in zinc ionization.

Clinically, iodin ionization seems to have very distinct benefit, and it is conceivable that within the root canal, with its inorganic walls to contain the ions, they may be highly germicidal.

In cases of acute tissue inflammation over the roots of affected teeth, iodin

ionization of the mucous tissue by placing a platinum electrode over a pellet of cotton containing a solution of iodin and passing a strong current for a long enough time to bleach out all the iodin in the container not only reduces the inflammation but also relieves pain in a short time.

In chronic alveolar abscess with a fistulous tract opening on the gum, treatment consists in ionization of the root canal with zinc ions in the usual way and sealing the cavity temporarily, then passing a copper probe through the opening on the gum the length of the tract until it reaches the root of the tooth. To this probe, the positive pole is attached and 3 or 4 milliamperes of current is passed for eight or ten minutes. The tissues will adhere to the probe, which can be released by reversing the poles and passing 1 milliampere for one minute. The tract will be stained green from cupric ions. These ions, like zinc ions, are highly antiseptic, and often a single treatment of root canal and tract by this electrosterilization method will cure a chronic abscess.

CLINICAL EDUCATION FOR THE DENTAL STUDENT*

By E. A. ROGERS, D.D.S., Iowa City, Iowa

THE subject of clinical education of the student in dentistry cannot be given the consideration it merits, from the pedogogic standpoint, in twelve minutes. My aim is, therefore, merely to offer suggestions concerning what seem to me important phases of our problem, rather than to attempt any real discussion of the subject. I shall limit this discussion to but two aspects of the matter: (1) the faculty; (2) the student; in other words, the man who trains and the man who is to be trained.

What type of man shall teach our students in the clinic? We may differ about the methods of teaching, but we do agree that the teaching staff should consist of fine men, well trained, of men with solid experience in dentistry, of men of the highest personal character. We should be regarding ourselves as past that difficult pioneer period when colleges had to take what they could get in teaching equipment.

The instructor should be intelligently sympathetic; for the ability to humanize his subject is of the greatest importance. He should be sincerely eager to help toward the growth of his students, should be receptive to questions, quick to encourage initiative, free, in a common-sense way, with advice and suggestions. He should have untiring patience and an understanding of the perplexities which confront the student. The teacher in the dental clinic should be enough of a disciplinarian for the spirit of an accomplishing order to prevail, yet unobtrusive enough in the use of his

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authority to maintain the complete confidence and respect of the student without building up a wall of restraint that might shut off the latter's expression of his own ideas. Ridicule and sarcasm have no place in the clinic; nor has the man who does not know how to give a deserved word of praise a place on the teaching force. The teacher's speech and manner should be that of a gentleman, and it goes without saying that he should be immaculate in personal appearance. I am willing unhesitatingly to affirm that our adoption, at the State University of Iowa clinic, of the all-white costume by the members of the infirmary staff, and, incidentally, the requirement that all students wear white coats during their infirmary hours, has been a solid improvement physically, psychologically, and why not tell the whole truth and add spiritually?

With genuine seriousness, I must state that we need, in our American clinics, at least, for I do not know European conditions, more men of full, deep experience; men whose "tone," as William James would say, "has the highest spreading power." Our best financial institutions set a value on men who have had twenty, thirty or forty years experience in their business; and I confess an admiration for those European universities that revere and keep in service men of 60, 70, yes, 80, who are still growing and yielding the richness that only long years of study and effort can give. Men of 22 or 24 cannot possibly have this wisdom, whatever other excellent qualities they may have. To take fresh graduates from our colleges and put them in as clinical instructors is unsound pedogogy. If we cannot secure the right sort of men, who, in addition to their university training have had several years of actual practice, then, experience forces me to believe, the next best plan is to select the right kind of man from the graduating class, to have him spend from two to three years in the technical laboratory, and then, if he proves an acceptable teacher there, to have him transferred to the clinic. While I am making no plea for retaining the halt and the blind on our faculties, neither am I an advocate for the young and inexperienced instructor.

It may be well here to emphasize the desirability of the presence, in the clinic, of all-time instructors, for I believe that it is a serious mistake to encourage the part-time scheme. The interests of the part-time instructor are bound to be divided, and the human thing to do, where a choice must be made, is not to allow the private practice to suffer. Then, too, the college association may be to often used, directly or indirectly, as a means of advertisement. This is, in fact, part of the compensation. I believe that it is better, for the college and the student, to engage the full-time instructor. To safeguard the growth of the full-time man, it would be wise to grant him, say, one full year's leave of absence out of his first four years of service, on full salary. This would make it fair of the college to expect a full year of research work or, if he preferred, a year of actual practice. The salary during leave would make it possible for him to offer his services free, if necessary, in an office where the experience would be a rich one. After the first four years on the teaching staff, a man should reap the benefit of the Sabbatical leave, say, once in seven years, on full pay, much as the scheme is worked out in some of our best liberal arts colleges. I can dwell on this only

as a suggestion, with the earnest hope that some one of my auditors will work it out in detail and, if need be, start what we call in the United States "a campaign of education" in the direction of university presidents, boards of trustees, state boards of education, or of all agencies interested in the sound progression of dentistry.

Turning to a consideration of the young men and young women who comprise the student body itself: Unfortunately, for some of them, as well as for the college, we cannot always tell before matriculation whether the individual student is to develop into the sort of dentist to whom the college can eventually grant its seal of approval. Yet, when we accept him as an entrant with the degree of doctor of dentistry as his goal, we impose certain obligations not only on the student, but also on the institution itself. When it has been determined that a student cannot be trained to occupy a worthy place in dentistry, he should be eliminated from the college. This knowledge of the student's limitations should be acquired as early in his course as possible, certainly before he is admitted to the infirmary. I feel that the dental faculty that permits an unfit student to go through his third year, not to mention a part of his fourth year, before telling him that he lacks the qualifications to become a dentist, deserves all the condemnation it is liable to get. With proper methods of instruction, the right sort of teacher should be able to determine, by the close of the first year, or not later than the middle of the second year, whether a student lacks the mental or technical ability to succeed in the profession. Yet we need to remind ourselves that, with a student of this type, we are doing our part only when we use every reasonable effort in convincing ourselves and the student that his choice of dentistry has been a mistaken one.

At the University of Iowa, which I mention merely as the source of much of my practical observation, to each student is assigned, at the beginning of the academic year, a dental chair, a cabinet and a unit with all of the accessories. This equipment and the number of square feet allotted him constitute his office for the year, and he is held responsible for any loss or breakage. Each student is required to keep on his cabinet a card index file in which he records the names of his patients, report of operations, time consumed and other items which should be recorded, in the interest of a history of the case, in any well conducted office. Duplicate charts received from the examination room are also kept in these files. On the reverse side of this chart, the student must keep an accurate record of the work done for each patient. When the work is completed, and is approved by the demonstrator in charge, the chart is filed in the clerk's office permanently. This process impresses the student with the importance of keeping accurate records from both a professional and a business point of view. The instructor, from time to time appearing unannounced, checks up the student on such points as neatness of bracket table, condition and arrangement of instruments, management of patients, general attitude toward the work, condition of chair accessories and floor about chair, and personal appearance, with special reference to cleanliness and neatness. The grades given the student on the points enumerated above are applied on the final

semester grade. Incidentally, let me say in passing that the instructor who cheapens standards by grading too low is especially to be guarded against, rather than the demonstrator who sets his standards high.

One of the defects in our system of education is that we have, as a rule, provided only for the average student implied in the preceding paragraph. I believe that the *number* of operations should be a little below, if anything, or at least within rather easy reach of the average student, in order that he may have sufficient time for deliberation and a careful execution of each individual case. The clinical requirements should never be a burden to the average student. There should be no doubt in his mind about his ability to fulfil them. While a student should have as great a variety of cases as possible, it is far better to have him handle a smaller number of operations of a superior quality, taking time to assimilate the full teaching value of each case, than a larger number at the risk of neglecting the more important phase of the work. He needs sufficient time to bring his sciences and ingenuity into play; to make observations and to study conditions; to draw sound conclusions. He should, also, bear a good part of the responsibility inherent in his work; do the thinking for himself; keep his initiative faculties active. The real teacher will know when not to overinstruct him.

When I speak of the "average student," as I have above, I hope not to be interpreted as overlooking the bright student; and while I urge the encouragement of good work at *slow* time, in some students, rather than the resting of work on a *speed* basis, I realize that there is also the problem of creating conditions to unfold fully the capacity of the gifted student. The point system, whatever its merits, is gravely lacking in meeting all aspects of the twofold problem.

In the dental infirmary with which I am most familiar, we are now dividing the students operating in the clinic into sections, with an all-time instructor in charge of each section. To impart more diversified instruction, the clinical demonstrators change sections occasionally. Frequent conferences of the heads of departments with clinical instructors, where they check up on every conceivable side of the student's development, are helpful, not the most trifling result of such conferences being the discovery of the weakness peculiar to each individual student. It is expected, for example, that the instructor, let us say, in cavity preparation, shall give a reasonable degree of special attention to the student found, in the common checking-up conference, to be weak in cavity preparation. Beyond regular clinical instruction, students are given special demonstrations, throughout the year, in clinical operative, crown and bridge work prosthetics, radiography and orthodontia. I might add that students get much profit, eventually, from conferences held between instructors in the technical department, on the one hand, and the clinical department, on the other; and much profit from the maintainance of a definite relation of didactic teaching to laboratory and clinical work.

The weakest spot in our student training today, and in the practice of dentistry, is traceable to lack of thorough training in oral diagnosis in its broadest sense. My own position is that students in the clinic should make con-

tacts with the greatest possible variety of patients, and be required personally to follow through a specified number of cases. For the most part, these requirements can be achieved in the examination room under the direction of an experienced clinical examiner. But certainly the heads of the several clinical departments have a duty here to perform, and should never lose an opportunity to assist a student in arriving at a sound diagnosis through constructive criticism.

We are trying to find our solution to this problem of diagnosis at Iowa. Our practice has been to assign two senior students each day to the examination room. With exhaustion of the list comes repetition of the process until, with facilities as they now are, each student gets to serve, on an average, six days. It would be more satisfactory for each senior student to devote twelve successive days to this work.

The students, while diagnosing, are taught to make inquiries concerning the general health of the patient. The general appearance as he enters the examination room is noted, with observation of such details as gait, poise, facial expression, color and condition of skin and the eyes. The observer must not only seek cavities in the teeth, a vacant place for the insertion of a bridge, partial plate or what not, as is often the case in so many dental offices, but he must also search carefully for any pathologic conditions that may be present in the soft tissues: syphilis, tuberculosis, precancerous lesions, periodontoclasia and Vincent's infection. When cases require a radiographic survey, further examination is deferred until the student can complete the survey under the supervision of the roentgen-ray technician. When the student has finally charted his findings and deductions, the instructor, of course, checks over those findings.

It would be well for all colleges to establish a diagnostic laboratory, with the necessary equipment and in charge of a competent internist, to carry out various procedures, such as the making of blood counts, the determination of the coagulation time of blood, the taking of blood pressure, urinalyses and microscopic and bacteriologic examinations. Students should be taken in small groups for several periods during the year to assist the internist in making the necessary tests. It is not expected that the seniors will become expert technicians along these lines, but that they will be taught enough of physical and laboratory diagnosis to be familiar with tests as applied in medicine and to understand better the significance of findings when reported to them.

Finally, may I not venture to assert, even with the possible disapproval of the more practical Americans in this audience, that I should like to live to see the day when most of our dental students may come to their professional college with a rich background of what the finest type of liberal arts college signifies, may come broadened and enlightened by that mountain-top view of the universe they shall have gained from sciences and letters and arts in a general way, naturalized citizens, so to speak, in the great world of man's thought and understanding. This, all other things being equal, will make them better students, in the dental clinic; this will make them, later, better teachers of dental students; this will make them better practicing dentists; this, with the thorough technical training which the

best sort of dental college will supply will bring our whole profession a little nearer to Matthew Arnold's great conception of human life as the "harmonious expansion of *all* the powers which make the beauty and worth of human nature." Emerson was not thinking alone of some remote band of evolutionists when he said that "To vision profounder, man's spirit must dive." He was thinking of all men, of dentists, if you please. And what William James heard and heeded with those splendid faculties of his, "the ceaseless whisper of the more permanent ideals." This whisper, we wish more and more of these coming generations of young dentists to hear. That attainment enters into the education of the *real* dentist of the future.

DISCUSSION

E. J. Rogers, Indianapolis, Ind.: Much depends on the man who trains. I agree with Dr. Rogers that "the instructor should be intelligently sympathetic." The gruff and surly have no place as instructors in a dental school. What we need as instructors are men who never forget their own college days, who remember the problems that they had to dig out, groping in the dark for the lack of better instruction before the light of knowledge came to them. These men always seek to lead the student onward and upward, instructing in such a way that the student will avoid many mistakes and pitfalls. Then the study of dentistry does not become irksome and full of misgivings for many who are not just sure of themselves. We, as instructors, need to be just a little more humane, a little more democratic. The personal touch has brought many a backward student into the front rank. A bit of deserved praise, given at the proper time, has brought to many a faltering heart renewed courage. It is true that we need men of mature judgment with years of experience on the teaching staff of our dental faculties; but we must get them on, or soon after, graduation, hold them on the dental faculty, where, by careful and proper instruction, they are enabled to develop and unfold into instructors who realize their great obligation to dentistry as teachers. If the capable graduate is allowed to leave the college and experiences the joys of a growing practice, he, many times, is lost to the teaching profession. I do not consider an instructor entirely inexperienced who, with his four years in a dental school, has two or perhaps four years of collegiate work. Many times, he has a better foundation for teaching than the old instructor of twenty or thirty years' experience. I believe that a true instructor will manifest his ability in some outstanding way during his dental course. I find that the young instructor proceeds with much caution, seeks advice from the older instructors and, in short, recognizes his obligations to the college and to the student. We realize that, today, there is a great demand for capable dental teachers. Dental schools should meet this great obligation by thorough preparation of the best fitted students for the higher calling of instructing the future dental student. That means to give him a place, not only in the mechanical laboratory, but also in the clinic. I cannot see the advantage of full-time men in the clinic. I believe that a man who has a good practice, which, by the way, gives you that "tone" and well-rounded experience in dentistry, is a little more broad-minded than the man who is strictly a dental instructor, who does not know the sorrows and joys of building and holding a dental practice. The purely dental instructor cannot possibly give to the student the advantage in his instruction of the wealth of knowledge which comes in a private practice. Some of the greatest work, not only in the dental field but also in medicine, has been done by men in private practice. It may be true that the interests will be divided, but the teacher who has caught the vision of service in dentistry as an instructor will give his best to both interests. No doubt, the fact that a dentist is a member of a dental faculty carries some weight among the laity; but a dentist who is imbued with the highest ideals of professional ethics will not capitalize his teaching position. It may be an ideal plan for full-time men, as outlined by Dr. Rogers, but a college of liberal arts and a school of dentistry are two entirely different institutions taught by an entirely different class of individuals. Many times, a dentist teaches, or seeks entrance to a school as instructor,

who could not build a practice or has failed as a practicing dentist. Just what effect will that have on the student body? Will he command the discipline and respect that a successful practicing dentist will have? And yet he may be a good instructor. To my mind, one of the hardest duties of a dental faculty is to eliminate from the roster students who cannot qualify. Are we always sure of our decisions? Of course, when it is apparent that the student's digital dexterity cannot be improved, when he lacks the coordination of the fingers and brain, although his mental capacity for didactic subjects may be excellent, he must be dropped. But what about the student who is on the border line? With proper instruction and encouragement, he may develop beyond our fondest hopes. I believe that such a student should be given a special course in technical subjects through a summer, but not later than the beginning of his junior year. We are wofully lax in the teaching of oral diagnosis in relation to the general health of the patient. The dental student today is taught to see just the oral cavity. If we are to prove to the public that dentistry is an important part of health service and that its practice is just as important in the maintenance of health as that of any accredited specialties of medicine, we must teach a broader oral diagnosis. We have demonstrated that certain common and simple disorders of the teeth may involve prompt and insidious development of serious and possibly fatal ailments in other parts of the body. The student must be taught that dental work, although superficially perfect from the mechanical and esthetic point of view, may hide local pathologic conditions which favor development of disease in other parts of the body. He must be taught how to search out these conditions by the use of the radiogram, blood count, urinalyses and other diagnostic aids. When the future dentist is able to do this, dentistry will take its place beside medicine as a healing profession. I do not believe that this is a radical position to assume, but that it is fundamental to the further development of dentistry as a healing art.

PROBLEMS THAT ARISE IN THE RELATIONSHIP OF EXODONTISTS TO GENERAL PRACTITIONERS*

By HARRY BEAR, D.D.S., Richmond, Virginia

THE status of the practitioner in dentistry has changed with the passing of time. The general dentist is a practitioner in all phases of professional work which belong to the art. Modern science, with all its diagnostic and prognostic complexities, demonstrates that it is not possible for one man to fulfil adequately the requirements of all these offices; hence, the advent of the numerous specialties.

There are, perhaps, many problems which confront alike the general practitioner of dentistry and the man who limits his practice to a special branch. Some of these situations may be endemic, or they may be epidemic; but the treatment of human beings is one of common concern. It is also true that the size of the community, its geographic location and its traditional professional ethics may affect the situation. Nevertheless, there must be items of common interest, and I shall present some of these as dental fables, with apologies to Aesop.

FABLE I

Dr. A. (General practitioner in telephone conversation with an exodontist): "Mrs. Jones is in my office and I have just broken off a molar. As I haven't the instruments to complete the case I want to send the patient to you. Can you see her now?"

Dr. X. (Exodontist, exhibiting the proper spirit of cooperation): "I shall be glad to send over any instruments if you will let me know just what you wish."

Dr. A. "Oh! No! No! I shall send the patient over and you take charge of the case."

FABLE II

Dr. B. (General practitioner in telephone conversation with an exodontist): "I have just broken off a maxillary third molar and left the roots in and I want you to give Mrs. Johnson a little gas and take them out for her."

Dr. X. "I shall be glad to handle the case, Dr. B., but you must leave the matter of the choice of an anesthetic in my hands."

FABLE III

Dr. C. (General practitioner in telephone conversation with an exodontist): "I have a patient in my office who has an impacted mandibular third molar, and she wants to know how much you will charge to remove it."

Dr. X. "I am sorry, Dr. C, but I cannot tell what the fee will be until I see the case."

Dr. C. "Can you give me some idea?"

Dr. X. "No, I cannot, as this would be manifestly unfair both to the patient and to myself. I shall be glad to advise you and the patient, if I am permitted to see the case."

FABLE IV

Mrs. Brown (Over the telephone): "Dr. X., what do you charge to take out teeth? I have just three left; what will you charge me?"

Dr. X. "I am sorry, Mrs. Brown, but I cannot tell you without seeing the case."

Mrs. Brown: "They are just roots, Doctor; it will only take you a minute to take them out."

Dr. X. "But, I cannot tell you my fee until I see the case. If you will come by the office and let me examine the case, I shall be glad to advise you and you can act accordingly."

*Read before the American Society of Oral Surgeons and Exodontists, Philadelphia, Pa., Aug. 21, 1926.

FABLE V

Mrs. Jones: "Doctor, how much will you charge to x-ray this tooth?"

Dr. X. "$5.00."

Mrs. Jones: "What will it cost to x-ray the whole mouth?"

Dr. X. "My fee is $20.00 and this is for an opinion and advice regarding your case."

Mrs. Jones: "That's funny, Dr. A. only charges $10.00 for the whole mouth, while Dr. B does it for $5.00."

Dr. X. "That may be perfectly true, Mrs. Jones. Every doctor is the best judge of the value of his own service. I am not selling merchandise or just so many films. The x-ray examination is incidental to the diagnosis; my fee is for a professional service."

FABLE VI

Mr. Johnson (To exodontist): "Dr. X., I would like to have you remove a few teeth for me."

Dr. X. "Who referred you to me?"

Mr. Johnson: "No one in particular, Doctor, I just heard about you. I understand you make a specialty of extractions. After you have taken out my teeth will you refer me to a good dentist to make the replacement?"

Dr. X. "Surely. You may go to see Dr. John Doe; he is very good for this type of restoration."

FABLE VII

Mrs. Willis (To exodontist): "My physician asked me to consult you about the condition of my mouth. Here are the x-ray films of the case. Dr. Smith, my regular dentist, says he can treat and save all my teeth. What do you think about it?"

Dr. X. "There are, in my opinion, six teeth which are hopelessly involved, and these should be removed."

Mrs. Willis: "All right, Doctor, I am in your hands and I'll do as you say.'"

MORALS

The general practitioner bears a direct personal professional relationship to his patient. He is the family consultant and adviser in matters pertaining to dentistry. As a rule, the practitioner whose practice is limited to a special branch is usually consulted only for the specific treatment involved. In the performance of his services, the specialist often bears the responsibility of satisfying both the patient and the referring practitioner, not only in the quality of service rendered but also in the manner in which the patient is handled.

It is manifestly unfair to the specialist for the referring dentist to make an apology or offer excuses for the necessity of referring a patient. Once the general practitioner realizes the injustice of such evasions and the advantage that must accrue from frankly telling the patient that Dr. X. is better qualified, in his opinion, to perform the particular operation, this situation will be overcome. This will assure the patient that he (the general practitioner) is primarily interested in the welfare of his patients.

It is also unjust to the patient and the practitioner to venture an opinion or give a fee in a case without seeing and examining the patient. The diversity of patients, the very nature of our work and the many uncertainties involved, make this impracticable; for, even after the case is examined, the fee should not be based upon the delivery of one, two, three or so many teeth as if they were so many articles of merchandise. So it is, too, with roentgen-ray examinations. The value of such services should not be determined entirely by the fact that there may be ten or fifteen films, because, even here, some of these variable conditions are also applicable.

We are not selling so many teeth or so many films as would a department store dealing with a fixed commodity of a determined value. The primary duty of all practitioners is the same; namely, the best interests of the patient. The matter of making something and

selling something takes a subordinate place.

When a patient consults one for a diagnosis or treatment, it is his moral and professional responsibility to advise the patient what, in his opinion, should be done in the case. It does not matter that the patient has been advised by dentist or physician; if he goes to another practitioner for his opinion, the dentist should give the patient the benefit of his best judgment, whether it differs from the previous opinion or not, or refuse to handle the case.

It is as much the duty of the specialist to direct unreferred patients to another dentist when his judgment so dictates, as it is the responsibility of the general practitioner to recommend the specialist when his services are indicated. Gentlemanly instinct, as well as professional ethics, dictate but one course to follow with regard to patients sent by a general practitioner to a specialist; namely, that the specialist refer the patient back to the family dentist. Those patients who are not sent by dentists and wish the specialist in one field to refer them to another should be properly advised. We are not fulfilling the highest ideals of our profession if we permit patients who should be judiciously informed to shift about looking for a dentist. It is a duty which we owe the patient, and a responsibility which should not be shirked.

There is little or no conflict in these respects between the specialist, on the one hand, and the general practitioner and patient, on the other, once the specialist gets the proper point of view. I am willing to admit that it is a greater problem to adjust the attitude of the general practitioner than it is to reach an agreement with the patient. The failure of the general practitioner to give unqualified support in instances has been due in a measure to his not realizing that the higher the level of excellence and remuneration which may be established in one division of practice, the easier it is to bring about a corresponding standard in the other branches of the profession. The specialist, too, is often at fault in not adhering strictly to the highest ethical code in his relations with the referring dentists. This is being more generally recognized, and a more nearly universal *entente cordiale* is being established.

410 Professional Bldg.

DIFFICULTIES INCURRED WITH GENERAL PRACTITIONERS*

By AUBREY L. MARTIN, D.D.S., Seattle, Washington

THIS short paper is to enumerate some of the difficulties incurred by an exodontist in every-day practice, with the object that its discussion may bring out some help for me as well as for other members of the society who are as unfortunate.

I have divided my difficulties under two heads: professional and financial.

Professional Difficulties.—Under this head are: incompetent interpretation of

*Read before the American Society of Oral Surgeons and Exodontists, Philadelphia, Pa., August, 1926.

roentgenograms, with instructions for extraction, leaving infected teeth to be used for abutments; gross misrepresentations of normal osseous structure for surgical interference; roentgenograms of previous work diagnosed as negative. In these cases of difference of opinions, I always call for a consultation with the referring doctor, but I am sorry to say all practitioners do not cooperate but rather resent interference with their diagnosis. They seem to think that a change of opinion in consultation lowers their standing with the patient.

Another type of practitioner disturbing to one's professional pride is the one who sends instructions with the patient, indicating the anesthetic desired, or asks for simple extraction with no assisting surgery, no stitching nor curetting. I generally disregard such instructions and operate in a way to render the best service to the patient. The results are often pleasing to the patient, but not to the doctor.

Another source of difficulty is misquotations made by the patient to the referring doctor. The doctor does not call nor ask for an explanation to verify the statement but takes the patient's words literally. I have come to listen with a great deal of suspicion to patients' statements about other practitioners or what they have said concerning me, for they vary from slight exaggerations to absolute falsehoods, and the sooner we all realize this fact, the happier the medical family will be.

I have been accused as I suppose many of you have, of switching patients from one practitioner to another or referring patients to friendly practitioners. Misunderstandings from both of these causes never come direct to one at the time, but "so-and-so told so-and-so," and by the time it gets back to you, it has been six months or a year since you have had referred work from the doctor. This difficulty cannot be overcome, as I see it, without educating the general practitioner as to our mode of handling referred cases. This, with the honest ethical handling of referred cases by all specialists should, in time, overcome the difficulty.

Financial Difficulties.—As regards the quoting of fees by the general practitioner: a patient presenting a difficult case makes no inquiry as to the financial obligations, being possibly so concerned over their own physical trouble. The patient is operated on and a statement rendered. He immediately objects to the fee, as the general practitioner has named a fee two or three times less than your charge. An incident of this kind is most annoying. We try to explain that the case is more serious than the doctor thought and that we wish some questions had been asked before the operation as an estimate would gladly have been given. If this does not suffice, we inform the patient that we make our own charges and Dr. Blank has no right or way of knowing, without consulting with us, what the charge would be. But this does not always close the argument. The patient feels that he has been overcharged, and often the doctor coincides.

As regards the doctor charging work to his personal accounts: the general practitioner has possibly had some trouble in trying to render a service, so calls us and asks for our assistance, requesting that the fee be charged to his account. Many of these bills are still on my ledgers—unpaid. What do you do?

General practitioners sometimes verify the patient's credit; the patient calls and asks for credit and refers us to the doctor, who verifies the bill. It has been my experience that doctors are poor credit bureaus, as often these bills are not paid until turned over to a collection agency.

These many difficulties with the general practitioner, I am happy to say, are in the great minority; but we have them and the more we endeavor to minimize them, the more pleasant will be our association. In the final analysis, the big thing to be accomplished, as a fellow specialist expressed it "is to keep the other fellow happy."

DISCUSSION OF PAPERS OF DRS. BEAR AND MARTIN

J. A. Heidbrink, Minneapolis, Minn.: When a patient has been referred to one for radiograms, and on taking the radiograms back to the dentist, is advised that the tooth is "dead;" and then the patient brings back the radiograms and is told that the other man can "fix it up," what can you do? It is a problem that has bothered me for a considerable time. In these cases, I have decided that I cannot practice exodontia without giving the patient the best information that I have, and to me this is one of the greatest problems that have been mentioned, even a greater problem than any that have been mentioned as far as relations with other dentists or the general practitioner are concerned. Our greatest duty is to the patient rather than to the man who refers the case.

T. L. Pepperling, St. Louis, Mo.: As a general practitioner, I would say if the patient is sent to one by a general practitioner and makes a diagnosis on the films, he should confer with the general practitioner before pronouncing the diagnosis. If he does otherwise, the patient does not get a proper conception of the case.

H. M. Davis, Baltimore, Md.: The general practitioner is particularly jealous of his position. Cases are sent in for which we are asked to do things that we know are wrong, and we are compelled to use our own discretion or do the thing that is asked of us. If all general practitioners were good ones, if they all had some idea of roentgenogram interpretation, it would be a different matter; but they send the case in for us to do that which they say should be done, right or wrong, and, unfortunately, it falls to our lot often to be blacklisted by many general practitioners because, as said by Dr. Heidbrink, we believe that we owe the first duty to the patient. When I am asked to take out one molar with an infected area that involves two molars, with the possible chance that the one left in is the primary cause of the disturbance, I must say to my patient, "I think that this is wrong;" yet I endeavor, in my practice, as nearly as I can, to protect the general practitioner. Never do I say anything that is going to injure him if I can avoid it, but when he asks me to do that which I should not do, I am compelled to say what I believe is right for the patient.

J. P. Henahan, Cleveland, Ohio: In reference to the idea that cooperation with the general practitioner is proper, I think that we all try to cooperate with him, and I think we put ourselves out, as a rule, to favor the general practitioner with his patient. In the particular way that I handle full mouth roentgen-ray examinations, the pictures are ready for a consultation with the patient. I also have a written interpretation (I do not call that necessarily a diagnosis) couched in terms that leave the general practitioner to do what he likes. Nevertheless, I feel that it is entirely within my province to advise that patient, while the patient is my patient, according to the ideas that I have myself. If I believe the teeth should be extracted, I feel that nobody has any right to question my right to say so; but I never extract teeth for any patient at the time I make this roentgen-ray interpretation. I say, "Before this is done, go to your general practitioner, because if you have these teeth taken out, you might go to your general practitioner afterwards, and he might say they should not have been taken out." I would rather have him know of their being taken out than to lay myself open to his criticism later.

Theodor Blum, New York City: It is correct to tell a patient that a certain tooth must without question come out, and we have no difficulty with patients about these cases. But when there is a question about the teeth,

and the question is as to whether it is up to the general practitioner, or whether an amputation should be performed, I feel that we should communicate with the general practitioner first and then tell the patient in our own way, or let the general practitoner tell the patient, what should be done. You can't tell the patient your opinion and then have the general practitioner give the patient another opinion. It is much better to have the general practitioner and the specialist exchange their opinions first, and then give the patient the result of such a consultation. Dr. Bear's paper was admirable. When my secretary has an inquiry about fees, we never quote a fee over the telephone because it is our practice and routine to adjust fees to meet the patient's circumstances, and if a patient or a doctor inquires as to fees, we cannot give a definite reply. We say that we adjust our fees to meet the patient's circumstances, and we not only say it: we do it.

Dr. Bear (closing): If we realize that there are two sides to these questions, as one of the general practitioners brought out, we will have fewer problems. If this were an audience of general practitioners and we were a few specialists, they would present the other side. It is true that the relations between the general practitioner and the specialist are more harmoniously adjusted when the two get together. If a patient comes to a specialist, having been referred by a general practitioner, it is only right and fair that he be given the opinion prior to the patient's being advised. In the case of medical practice, when a patient is in the office being treated and a consultant is called in, the two doctors go over the case before the patient is advised, and the same thing holds here. Of course, when the patient comes in of his own accord, there is nothing to do but give your opinion regarding the case. We must not assume that, in the differences of opinion, we are always right and the general practitioner is always wrong. It is true that there are cases in which any decision made is doubtful. You may entertain one view, but you must concede to the general practitioner that he has as much reason as you have for his views. When the two get together, everything is usually satisfactorily adjusted.

THE MECHANICAL SIGNIFICANCE OF PERIODONTAL DISEASE AND A CONSIDERATION OF SOME POST-OPERATIVE MEASURES FOR REORGANIZATION AND CONSERVATION*

By JAMES KENDALL BURGESS, D.D.S., New York City

IF we would understand any depreciation from the normal, we must first comprehend the normal. If we would estimate the influence of disease, we must first appreciate health and function of the part or parts affected by disease. If we would determine the mechanical significance of periodontal disturbances, we must first know mechanical values as they relate to the dental apparatus.

The human denture is a machine, a highly specialized piece of mechanism, and its service to the organism is of a purely mechanical character. Esthetics, as this term pertains both to the matter of physical appearance and the quality of articulate speech, has to do rather with the individual's relations to organized society; but the real value of the denture to the organism itself is the mechanical aid it renders toward its nourishment and maintenance. Its position in the body, the conformations and arrangements and relations of its parts, the structural materials of which it is composed, its activating mechanism, and its modus operandi—all conduce to this one end. It must be conceded that its highest performance of function demands the maintenance of its complete integrity; that any deviation or alteration from Nature's normal in the conformations or arrangements or relations of its parts, or any deterioration of its structural materials, will disturb its integrity and have a commensurate bearing on its function; that when these changes have progressed beyond a certain latitude which Nature gives, function is impaired, service is diminished in like measure and the organism is deprived of its benefits; and that, on the approach toward the normal from this state of deterioration or disorganization which it is possible to restore in the individual case will depend the welfare of the denture and the measure of efficiency of which it is capable; and the welfare of the organism as far as it is influenced by the welfare of the denture and the service it renders.

The dental apparatus, for the purpose of this study, is divided into two factors; the service units or teeth, on the surfaces of which the actual work of grinding and trituration is accomplished, and the investing tissues or foundation into which they are anchored and secured for this purpose. It is the relation of these two factors which forms the real basis of these considerations;

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for no matter what degree of perfection in conformation and quality is inherent in the individual units or possible to them through restoration, once they are altered from the normal they are powerless to carry out their purposes without the support of the foundation. Given the other essentials of conformation, quality and relations, the measure of this foundation support will determine the measure of their efficiency. The foundation, then, which is the especial object of the care of your specialty of peridontology, becomes the matter of paramount concern in denture service, the one to which all other matters pertain and must be related.

That Nature has so coordinated all of these factors in the interests of service is beyond intelligent question. Let us examine some phases of it briefly, beginning with its inverted base in the maxillae and going through to include the movable arm driven by the motivating mechanism to perform the actual work of trituration: first, the maxillae themselves and their associated bony structures constituting the real base; then, in order, the alveolar process protruding from the base and terminating in a series of irregular openings, the connecting ligamentous membrane, the submerged portions of the service units, the gingival tissues encircling the submerged portions at the irregular line of submersion, the bodies of the service units, the horizontal surfaces imposed upon these bodies and rising from these blade or cusp—single, double or multiple, as the case may be; this, for the stationary part of the mechanism. For the movable part, we begin with the cuspated horizontal surfaces and repeat in inverse order until we include the mandible, which constitutes the base of the movable section. These cuspated horizontal surfaces mark the plane of division between the stationary and movable sections of the apparatus and constitute the service surfaces between which is performed the actual work for which the entire apparatus was fashioned.

It must be obvious, then, that the whole construction is designed to underpin and support these surfaces in that performance. Here, we have the production of service through the application of pressure or force between these horizontal surfaces supported by the complex mechanism described and activated by the motivating apparatus. It is patent that Nature has coordinated all of the factors which enter into this production of service, i. e., the respective areas, characters, conformations, arrangements and relations of the occluding surfaces; the directional application of the force during activity; the load or stress generated and passed on to the supporting foundation in this application of force; the support or resistance afforded by the foundation to bear the load or stress; the character and conformations of the foundation; the arrangements and relations of its component structural materials; and the relations between the service units and the foundation by means of which it is enabled to furnish support for the occlusal load or stress. This is Nature's perfectly balanced plan; and any deviation from or alteration in any of its factors is, to a commensurate degree, an unbalancing influence.

If the mandible, when set in motion, operated on a vertical plane only, we should have but a one-direction or vertical stress against the service units, in which case they would be mere pillars

or columns for the support of the horizontal surfaces which they bear; but the character and the measure of the service that they are called on to perform is such that vertical stress alone is not adequate for its performance. We find, therefore, that Nature has provided multiple-direction stress, comprised in the excursive movements of the mandible which follow the mandibular drive and occlusal surface impact against the nutrient mass under trituration. Thus, we have force applied not only in the vertical direction but also in various combinations of the vertical, the lateral and the mesiodistal directions; so that each service unit, in addition to its status as a column for the support of the triturating surface, becomes a lever with its fulcrum at the circumferential line, where it meets and enters the supporting foundation; its free or service end protruding beyond the foundation and terminating in the expanded end or surface against which the force is applied—the surface of attack; and its anchored and supporting end embedded in the supporting structure up to the fulcrum or line of entrance, which obviously becomes the line of division between the service end and the supporting end. Even a casual consideration reveals the fulcrum placed well toward the surface of attack where the force is delivered; and by far the greater length of the unit anchored to resist this force, with the evident purpose on Nature's part of giving strength and rigidity to the mechanism. And, as though this disparity in favor of the anchored end were still insufficient for the purpose, the units have been placed in the relation of close contact on their proximal sides and given a relative angle of stance to their contiguous fellows, their antagonists and their respective foundations, all of which add greatly to the stability of the individual units and the compactness and firmness of the mechanism as a whole.

The only movement thus left to the individual unit under functional stress is the measure of compressibility found in the dense uniting ligament interposed between its anchored end and the retentive socket into which it is anchored, which is merely sufficient to protect both the unit and the foundation from the destructive resorptive influence of the continual application of force at the surface of attack.

I have outlined here such mechanical factors comprised in the organization, construction and operation of the normal dental mechanism as seem pertinent to this discussion.

It is not the purpose of this discussion to urge the indisputable fact of the incoordination in any particular of these perfectly harmonized factors of this mechanical entity as bearing a causative relation to periodontal disturbances so much as to trace the influence of such disturbances, from whatever cause, in their inevitable incoordinating and disorganizing effect; and I have been at some pains to build up the picture, as it were, in order that we may the more readily perceive how its beauty and harmony and effectiveness may be disturbed and started on its way to disorder and ruin through a false stroke or an inexcusable blemish.

There is one factor vital to these considerations which we have not yet discussed, the character of the structural materials of which this unique mechanism is composed. The integrity of every mechanism depends not only on the conformations and relations of its parts but

on the nature and quality of its structural materials as well; and obviously its continued integrity demands the protection of these materials from every influence, mechanical and chemical, inimical to their welfare. Since our discussion pertains to peridontal disease, it is only necessary to consider here, and from this point of view, the peridontal structures or the foundation. Here, we have that part of the mechanism which forms its bulk and bears the brunt of the service in which it engages composed of vital tissues connected with the general circulatory system, subject to the operations of this system, dependent for its integrity on unimpaired operation, and subject to degenerative changes as the inevitable result of any such impairment. These vital structures are of two general characters: the bone, which constitutes the frame work, determines the form, gives strength to the foundation and provides the retentive sockets into which the service units are anchored; and the vascular fabric, which completely overlies the bone and lines its retentive sockets, and which exercises a nourishing function and affords protection from external disturbing influences. With this vascular fabric intact, there is no direct access from the outside into the bony structures and, as a consequence, no primary lesion or disturbance coming within the scope of these considerations to which they are subject. But since the bony structures are dependent for their integrity and welfare on these nourishing and protective functions of the vascular tissues, it must be evident that any alteration in the status of the vascular tissues is immediately reflected in the status of the bony structures; so that, if from any cause whatever the perfect balance of the circulation in these tissues is disturbed, they are deprived in a commensurate degree of their power to nourish, and the bony structures must inevitably suffer in corresponding measure.

If the disturbance is carried in length of time or degree of severity beyond a certain latitude of tolerance, which Nature seems always to allow, atrophy of the bony structures to a proportionate extent will inevitably occur. Where the disturbance to the circulation is initiated at the fulcrum, or line where the service unit enters the foundation, the first effect of mechanical significance is the loss of tone of the vascular tissues, which close about and grip the unit in this region; and since all of the foundation materials, bony and vascular, play their respective parts in stabilizing the units for service, this loss of tone and consequent lessening of the constrictive force of these tissues deprive the units by so much of their stabilizing influence; and because the fulcrum must be considered as placed where the stabilizing influence of the foundation tissues actually begins, we have, even in these circumstances and to however slight a degree, a change in the circumferential outline of the fulcrum and a shifting of the fulcrum away from the surface of attack on the service end of the lever. As the disturbance continues and its progress increases, bone atrophy begins and progresses, bringing a constant change in the circumferential outline and a continuous recession of the fulcrum.

Thus, we have a progressive lengthening of the service end of the lever and shortening of the enclosed end, and a constant retrogressive change from Nature's normal in their proportionate lengths. In the earliest stages, the in-

fluence of these changes may seem to be more theoretical than practical, because, up to a given point, it would be difficult to determine any diminution in the measure or quality of service capable to the denture. This is true because of a certain degree of tolerance on Nature's part; but it cannot be denied that however slight and apparently unimportant, it taxes that tolerance and consumes the latitude which Nature provides by so much; and that every stage of its progress brings danger nearer striking distance. When the latitude has been traversed and the danger line is reached, the service units do then begin actually to move in function because of the loss of material and its stabilizing benefits from the foundation. As progress continues, the foundation wastes, and with it go supporting anchorage and resistance to stress, resulting in a progressive unbalancing of the relations between the stress required for service and the necessary resistance in the foundation to support it.

Thus, we have one of two conditions: a serviceable, if reduced, stress generated against a reduced and insufficient foundation and hastening its destruction through rapidly increased disturbance to the circulation; or an insufficient service limited to the measure of resistance left in the reduced foundation. With continued progress of the destructive process, the movement of the units is increased to sway, and presently comes to the stage, too familiar, where, with supporting bony structures completely wasted or so reduced as to be inconsiderable, only a ligamentous attachment is left and that generally greatly diminished and of no consequence. The unit is completely out of service and beyond hope of retention and so its removal completes the tragedy.

This line where the fulcrum and service unit meet or what I would call, if I were writing in dental terms rather than mechanical, the gingivocervical juncture, is what I have spoken of on numerous occasions as one portal of entry for disturbing influences that undermine the service units and destroy the foundation of the denture. What these influences are, it is not the province of this essay to discuss, being concerned with effects rather than causes and post-operative aids rather than preventives. They are practically all preventable, and an appalling proportion of them are manufactured right in the offices of men holding diplomas as doctors of dental surgery, or similar degrees. The god of consistency, it seems, must have his little joke, but it is certainly rough on the patients. I have tried, by way of emphasizing the point, to think of some procedure in the field of mechanical effort that would be as preposterous as the performance of a dentist who makes, for example, a so-called shell crown that flares out from the base of a tooth, fills it with cement and rams it into the soft tissues; but it eludes me. It must be said to the glory of gas-fitters and plumbers that they have more sense.

Another portal of entry, and the only other to be discussed here, is the retentive socket in the foundation. In such a case, not complicated by disturbances at the portal previously discussed, the initial disturbance to the circulation must involve the uniting ligament lining the socket and its influence be reflected in the impairment of the contiguous bony wall of the socket itself. It is not necessary to trace the sequelae

step by step. Starting from a different portal and barring interference, it will follow its own destructive course, involve ultimately the same supporting structures and eventuate in the same tragic denouement. Much of this trouble also is of the dentist's own making, the result of a lack or misuse of engineering sense. Yet the men who perpetrate it very likely would be scandalized to see an engineer set up the Singer Building on a sand lot without even stopping to level it off, let alone digging down to rock bed for foundation. The difference between such an engineering problem and one in the oral cavity is not one of principle, but merely of size.

These two portals of entry are so nearly associated that, whatever the disturbing influences to either or both and whether they proceed simultaneously or consecutively, once underway, the regions contiguous to both will early be brought under their baneful operations.

We come now to post-operative measures. Thus far, I have kept the consideration as far as possible in the realm of the mechanical. There is nothing in this inconsistent with a theory of organic invasion and destructiveness and their pathologic significance. But whatever the etiology of periodontal disease, the resulting tissue destruction in a vital organ so highly organized mechanically must of necessity alter its mechanical integrity and bring about results of mechanical significance. Nor is there anything here incompatible with the histologic character of the component structural materials or tissues, their anatomic conformations and relations or the physiologic processes by means of which they are perpetuated. All of these matters have their mechanical aspects, and, as a profession, most of our shortcomings have arisen out of our failure to give this phase of practice the time, thought and effort required to develop the mechanical sense necessary to treat a complex mechanical apparatus with understanding, apart from every other consideration, of its mechanical requirements.

In offering some postoperative suggestions, it is assumed that causes have been removed and effects overcome as far as the circumstance of the individual case will admit, and thus a state of health has been established in such foundation material as remains after the ravages of the disturbance have been brought under control. In many such cases, by reason of wasted foundation material and consequent weakened support, as already discussed, teeth will be subjected to an excessive range of movement under masticatory stress and, as a consequence, will be found incapable of adequate service, if any at all, or else, when brought into service, their foundations will be unduly strained. Unless some remedial measures can be instituted, teeth so involved become liabilities rather than assets, and must be dealt with on that basis. If prospects seem favorable for bone regeneration and foundation rebuilding to a substantial extent, the provision of some simple temporary measure for stabilizing the teeth while Nature is building around them would seem the rational course to be pursued. I am not well enough acquainted with this phase of your special effort to discuss it intelligently. My suggestions are for those cases beyond hope of such further aid from Nature. Lacking means of procuring adequate support, either quantitative or qualitative, in the foundation

itself, some plan must be devised to limit the range of the movements of the teeth during stress, and especially the lateral stresses of mastication, so that the force delivered to a given foundation, both in strength and direction, may be brought within the stress-bearing possibilities of that foundation. The fundamental principles involved in the relations of this society of dental units is that which must obtain in all harmoniously organized society: Equals must render mutual support and the strong must aid the weak. In order that this principle may be vitalized and become operative, a supporting relation of the teeth must obtain or be established on their proximal sides and as near as practicable to the occlusal surfaces, where the initial force is delivered. Obviously, the closer the resistance to the point or surface of stress, the less will be the leverage exerted and the more effective the resistance offered. In many instances in which teeth approximate but are not in actual contact or sufficiently rigid contact, and foundation waste has not progressed too far, the simple expedient of placing occlusoproximal restorations, one or more as conditions demand, contoured to rigid contact of the teeth involved, will suffice. In a number of cases in which more than two teeth were involved with not too wide spaces between them, I have found it a simple and effective procedure to force or crowd the teeth to a relation of close contact on their proximal sides, giving one wider space instead of several narrow ones and then inserting inlays to maintain firmly all the contact relations. When foundation waste has brought the teeth to a state of insecurity, which renders these simpler methods insufficient, I have found stabilizing devices of two general characters of great benefit in the production of increased service and lengthened periods of usefulness—one for the posterior teeth and another for the anterior. A brief description only is necessary. Let us begin with the posterior. A secure tooth, if possible, is selected as a terminal abutment. For this, there is constructed an occlusoproximal restoration, flattened on its proximal side and containing an occlusocervical tubular opening, going as deep cervically as conditions will permit and opening for nearly or all of its depth on the flattened proximal side. For this cavity in the inlay, a supplemental inlay is made, which, when placed in position, will complete the proximal contour. For the contiguous insecure tooth, there is constructed a type of attachment designed to obtain a security of grasp sufficient to resist dislodgment under any prospective stress to be applied. I have depended almost exclusively on the McBoyle attachment for this purpose, though a three-quarter crown will suffice, or a shell crown—if you believe in shell crowns, which I do not. These three parts are assembled on the teeth, a small impression is taken, the supplemental inlay is soldered to the adjacent attachment on its proximal side and the two attachments are cemented to position, leaving the supplemental inlay uncemented. The insecure tooth is thus limited in its movements against the vertical and lateral stresses of mastication to the range of movements of the secure tooth, plus whatever flexibility it seems wise to provide in the individual case between the supplemental inlay and its pocket; and the interproximal space is bridged over and its tissues are protected from

food impaction. If there are two or more insecure teeth, it will necessitate duplication or multiplication of the securer type of attachment, each preferably with a flexible joint. I have found this type of stabilizer especially serviceable and grateful in numerous cases, those in particular in which the distal tooth in the arch was drifting and, having no means of additional support from the rear, had to be anchored, if at all, on its mesial side. I use this same principle of the flexible joint in many cases of bridgework; sometimes to aid a more or less weakened abutment tooth or its adjacent fellow and many times merely for the purpose of bringing an additional tooth into the bridge foundation. I rarely place a posterior bridge with a single tooth as its forward abutment, and I frequently include in the same manner an additional tooth in the posterior abutment.

The anterior teeth, on account of their difference in bulk and conformation, and especially for esthetic reasons, demand a different type of attachment. For this purpose, I know of nothing so satisfactory as the pinledge. We have in this an attachment simple to construct and filling every surgical, engineering and esthetic requirement. It is essentially a backing for a natural tooth, with a series of ledges on its dental surface, which rest, when in position, against corresponding ledges formed in the lingual surface of the tooth and carrying small iridioplatinum pins protruding from the ledges of the backing into openings drilled for them through the ledges of the tooth at points furthest distant from the pulp. The stabilizer consists of a series of these pinledges soldered together on their proximal sides and cemented to position. Both terminal abutments should, if possible, be secure teeth. Being thin, about 28 or 30 gage, there is little difficulty in occlusal accommodation for their placement on upper teeth, and since they are confined to the lingual surfaces of the teeth, they are out of view when in position. I have used the pinledge to unusual advantage for checking elongation of a single tooth by the simple plan of securing the tooth involved to one contiguous fellow. None of these devices necessitates pulp removal; they are all simple of construction and effective aids to reorganization and conservation of the disorganized denture beyond any consideration of cost in time and effort.

DISCUSSION

Edward B. Spalding, Birmingham, Mich.: The picture of harmony and perfection of the normal dental mechanism, and not only the possibility but the probability of its disturbance, has not been painted by Dr. Burgess just for this paper and this occasion. This picture has been indelibly etched on his mind by years of conscientious effort to make mechanical restorations which would tend to bring a return to normal, or at least check the destruction going on in the periodontium. One of the periodontist's most difficult problems is to have restorations made on his patient's teeth which conform to his ideas of health for the periodontium. When we see the atrocities that are frequently perpetrated on the human teeth in the name of restorations, would it not be better if at least one-half of the restorations were never attempted? I wish that every dentist essaying to make bridges, bridge splints, crowns of every kind, inlays and fillings, could have Dr. Burgess' picture of the dental mechanism and its functioning constantly in his mind. If he would then make study models of his cases *and study them*, so that he could, as Dr. Burgess suggests, "treat a complex mechanical apparatus with understanding," then patients would get dental services of a constructive rather than of a destructive nature. How much better would mechanical

restorations be made if every dentist would study and practice periodontia in connection with his other work for a few years at least. I cannot add to Dr. Burgess' picture, but do want to stress some of his suggestions for operative measures. His advocating flexible joints in his bridges and splinting indicates his appreciation that Nature never intended that a tooth be so rigidly fixed to another tooth that it could not have a certain amount of freedom in function. Granting that we are dealing with a tooth that has lost considerable of its supporting socket, if that tooth is rigidly fixed so that it cannot move in function, circulation in the remaining portion of the socket will not be normally stimulated. I have observed cases of fixed bridgework in which the abutment teeth, and necessarily the whole bridge, had excessive movement. When the bridge was replaced with one which gave more individual freedom to the abutments, they became much firmer, and the whole periodontium gave evidence of better health. After disease has left him, a man does not gain strength by lying in bed. Action, exercise of the right kind, is necessary to healthy circulation, be it that either of a man or of his teeth. Had Dr. Burgess the time in his paper, he might have treated the great necessity for proper tooth form in restorations, both the occlusal surface and the general contour, as well as contact surfaces. I strongly feel that more injury is done in the periodontium from the presence of faulty occlusal surfaces than from traumatic occlusion. When we observe caries attacking the approximal surface of a tooth, or see an inflamed gum septum, it may usually be explained by an improperly shaped occlusal surface. Either the marginal ridge is higher on one tooth than on its approximating neighbor, or the grooves, the spillways for the food, are missing or misplaced. Two natural teeth taken individually may be perfect types in form, contour and occlusal surface, but, in their positions in the arch, present to each other such surfaces that they do not deflect the food in mastication and are a menace to each other and the periodontium. If Nature makes a mistake, does the dentist correct this? He should, but too often the restoration only restores the abnormal form, and many times the abnormality is left worse than Nature made it.

Isador Hirschfeld, New York City: Dr. Burgess' presentation clearly indicates an intimate knowledge of the principles of mechanics. It shows, also, his familiarity with the abnormal morphology of the masticatory apparatus resulting from the various degrees of periodontoclasia as well as his appreciation of the corresponding loss of functioning efficiency in a machine so affected. In this study, he weighs very delicately the relationship between the form, bulk and position of the teeth, also the extent to which they are imbedded in the bone, and the dynamic forces to which they are subjected at the time of their greatest strains. Naturally, therefore, the suggestions in the latter part of his paper with regard to means toward rehabilitation of such a weakened dental outfit are worthy of close consideration. It is to this portion of his presentation, especially, that I wish to confine my discussion. I have had numerous occasions to test, and with a great deal of satisfaction, the appliances suggested by Dr. Burgess. His interlocking device for the stabilization of posterior teeth is a great comfort where needed. I use it quite frequently, thanks to Dr. Burgess' personal suggestion to me some time ago, for the purposes that he described. I find it a great source of satisfaction, also, when used occasionally as a preventive means to obviate such probable anatomic distortions, with their consequent dental caries, as may be brought about by the following circumstances: (a) When a posterior tooth is extracted, if the cusps of the adjacent teeth are long or especially if they have been worn into mesodistal oblique facets, the loss of mesodistal contiguity invites a shifting and food impaction. An early replacement with an artificial substitute will easily prevent this. If the tooth extracted is at the distal end of the arch, as in the case of a third molar, the interlocking inlays would give the desired effect. (b) When the mesodistal relationship between the opposing wisdom teeth is such that the extraction of one would permit the elongation or extrusion of the other, the utilization of the interlocking inlay may prove of great advantage in the prevention of such extrusion, but the placement of the tube and supplemental inlay must be reversed; namely, the former is placed in the distal tooth, while the latter is usually soldered to the inlay in the mesial tooth. The pinledge appliance used in the anterior part of the mouth may not

only improve the prognosis of an individual tooth divested of most of its alveolar support, but may also obviate, in a great measure, the early loss of adjacent, somewhat loosened, teeth. It has been my observation that, whether the natural tooth is retained through the aid of the pinledge attachment method, or whether an artificial substitute is inserted by this means, loosened adjacent teeth benefit greatly, provided, of course, the work is properly executed. On the other hand, when such a tooth is extracted, it is difficult to replace it by any other means without mechanically jeopardizing the two adjacent teeth, especially if they too are abnormally movable, as is usually the case. Dr. Burgess mentions his use of the pinledge attachment in the anterior part of the mouth for the purpose of checking the elongation of an individual tooth. Such a tooth is often seen to elongate continuously out of the socket, while the others, even if previously affected, stay put. Furthermore, it may continue to come out into traumatizing occlusion just as often as it is ground out of it. I have seen it and its occiusal opponents ground and reground to an acute hypersensitiveness, and I know of instances in which pulps are extirpated so that regrinding could be continued. It has been my experience, in some cases, that when the grinding was guided by a thorough study of tooth form and of the forces concerned in the straining of the tooth, further elongation did not occur. In other mouths, the pinledges described by Dr. Burgess were utilized with excellent effect. In these instances, further regrinding is often dispensed with. On the contrary, the tooth is retracted, instead, out of traumatic occlusion into the alveolar process by means of a contracting ligature prior to the placement of the pinledge attachment. After listening to Dr. Burgess' paper, I cannot but feel that patients would benefit immensely if the dentist who attempts postoperative restorations were as familiar with periodontology as Dr. Burgess is. Restorations would then tend to lessen the predisposition to a return of disease, and more cases of periodontoclasia would have a favorable prognosis.

THE CLINICAL SIGNIFICANCE OF THE INFECTED DEGENERATING PULP*

By U. G. RICKERT, D.D.S., Ann Arbor, Michigan

THE attention of the dental profession has been so tenaciously focused on pulpless teeth as possible foci of infections that another, in many respects more serious, aspect of dental infection has been rather generally overlooked. I have reference to the vital but infected and slowly degenerating pulp. About a quarter of a century ago, Seberth, Goadby, and more recently Hartzell and Henrici, Price and Collins, called attention to the presence, at times, of organisms in vital pulps. Until recently, no real clinical significance was given to such infections other than the argument it gave to some of the more conservative members of the profession, who asked why, if vital teeth are also at times infected, we should be so much concerned about infected pulpless teeth. The more recent writers have always attributed such infections to extensive dental caries and pyorrhea. Dr. Hartzell, culturing carious and pyorrheic teeth, has presented figures ranging from 38 to 44 per cent, which is considerably higher than our results from a more limited number of cultures. Dr.

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Haden, in culturing uninvolved vital teeth to be used as a correction factor in determining the possible errors caused by contamination while culturing pulpless teeth, finds that cultures from vital teeth result in a considerable number of positive growths. These he considers due, as a rule, to contamination. I mention the work of Haden, in this report, acknowledging that the cultures were taken for a purpose different from those of the other investigators.

There are so many possible complications in the culturing of teeth that percentages may be very misleading. To illustrate: From a limited study, we have become convinced that not more than one tooth with a vital pulp should be extracted and cultured at one time from the same quadrant. From the few cases that were studied for this particular information, we have become quite certain of the metastatic circulatory invasion induced by the first extraction, frequently resulting in passive embolisms in the pulps of vital teeth in the same quadrant. This appears to be especially true in cases in which the first teeth extracted were infected. The pumping movements during the process of extraction, under certain conditions, appear to drive the organisms into both the venous and the arterial circulation. The severe systemic reaction at times observed when a large number of infected teeth are extracted at one time and the tremendously large number of pulps found vital in pyorrheic teeth reported as infected by Dr. Hartzell led to a special inquiry, which will be reported in full when the work is completed.

The peculiar circulation of the pulp seems to permit the ready formation of passive embolisms. We have been aware of this fact for some time. It is also of interest that Edouard M. Hall and others have had similar results in treating infected teeth in the same quadrant. We believe that our results, i.e., a lower percentage of vital teeth infected, may be due to a consideration of this point.

I have been unable to find anything in the literature previous to a year ago that definitely called attention to the serious secondary effects of infected degenerating pulps. In a paper[1] published in 1925, I gave the few symptoms that we had observed, slightly differentiating the secondary effects of vital and pulpless infected teeth, and promised to report more in detail later. This paper is written, in part, to fulfil that promise. The symptoms that we described then have fortunately been independently observed by Leslie Kahn.[2] The limited clinical symptoms presented in these two papers by case histories are so much alike that they could easily be taken as reported by the same observer.

It is evident from the large number of letters received immediately after publication of the above mentioned report that many operators have become aware of the clinical significance of degenerating pulps. While we at that time expected to be ridiculed and severely criticized, we were happily surprised by the general approval expressed by the letters that came from far and wide. One of the most interesting comments came from a New York dentist: "You may be right about the seriousness of the infected degenerating pulp, but soft pedal the subject, for if the medical profession ever get the idea that vital

1. Rickert, U. G.: Dent. Cosmos, 67: 635 (July) 1925.

2. Kahn, Leslie: Items Int., August, 1925.

teeth may at times be infected and a menace to general health, Heaven help us."

I have three objects in writing this report: (1) to emphasize the importance of diagnosis; (2) to stimulate greater respect for the vital uninvolved pulp, and (3) to encourage intensive research.

Diagnosis.—In every community in which the medical and dental professions cooperate as they should, patients are referred to the dentist by the physician for dental diagnosis and consultation. The patient may have a brief case history, with the physician's diagnosis. A cordial statement of the known facts, as determined by the physician usually, reads in conclusion, "Please advise as to the condition of the teeth." If, as dentists, we hope to win and hold the confidence of the medical profession, it becomes highly important that we qualify for this responsibility. At the present time, many dental diagnosticians still believe that, when all pulpless teeth have been extracted, the patient may be referred back to the physician with the certainty of a clean bill of health as far as the teeth are concerned; which may or may not be the truth. Such a diagnosis may be as incorrect as the one at the other extreme, in which the operator still believes that all apparently well filled roots, without evidence of periapical change as determined by radiogram, give assurance of safety; which is also a conception that may or may not be true. Our diagnostic methods for definitely establishing pulpless teeth as the etiologic factors in individual cases is still far from complete. It is usually executed by elimination, and wise indeed is the operator who gives no positive assurance as to the probable results that follow such a diagnosis and operative procedure.

Before we have completed positive and definite diagnostic methods with respect to the pulpless tooth, another demon of the night appears in the form of the infected degenerating vital pulp, which places a new responsibility on dentistry. To what extent such teeth initiate secondary effects, we are not as yet prepared to state. The pulpless tooth has been by one or another observer held responsible for nearly all known diseases. We will be fortunate if we can avoid such exaggerations with the degenerating pulps. The cases studied to date give us most damaging evidence against such teeth in certain forms of arthritis and myositis. Such teeth also appear to be associated with involvement of the eye in some cases. Our evidence so far is less complete with respect to eye conditions than it is in the cases of arthritis.

The literature is so burdened with case histories that one at this time hesitates to continue with such evidence, especially so in view of the chances of error that are likely to prejudice the enthusiastic clinician. But since I shall permit the reader to draw conclusions as to the value of clinical observations as evidence, I believe that I am justified in the citation of a few typical cases.

Eighteen months ago, Miss S., aged 30, was referred from the University Health Service with a diagnosis of acute arthritis localized in both shoulders. She had six pulpless teeth, which appeared from radiographic evidence to have been well treated. The physician had studied and treated her case for several months, but the pain was gradually becoming more acute. We were about to advise extraction of the pulpless teeth when it was decided to go over the history once more. The initial stage was marked with a stiffness of the muscles of the

neck of several days' duration. This was followed with myositis of the gluteal muscles of the back, and finally settled in the shoulders.

We have so often observed this symptom associated with infected degenerating pulps that, in these cases, we make a closer examination for such probable relations. The upper right central incisor, which had a medium sized gold filling, did not respond to the several pulp tests as normally as did the left central, so we resorted to the drill. The pulp was exposed without much pain, but infiltration anesthesia was required for its extirpation. As all the precaution for culturing had been taken before the exposure, a culture was made. The pulp was infected with streptococci, as was determined the following day. Beechwood creosote and eugenol was first used in treatment.

The patient returned twenty-four hours after pulp extirpation and insisted that the pains had about disappeared, and in forty-eight she again returned and was able to swing her arms. She stated that it was the first time in several months she had been able to do this. Two days after the inoculation, there was a definite localization in the shoulder joints of a rabbit injected intravenously. At this time, the patient, who had six pulpless teeth when she came to us, and one other which was treated by us, was apparently well again. The phenomenal recovery made a tremendous impression on the patient. We kept her under observation for a little more than a month and discharged her with the definite instruction to return in case of further trouble.

In this case, the six teeth might easily have been extracted on suspicion and the active one permitted to remain. It is a typical case and the clinical and laboratory results have confirmed our diagnosis as far as it is possible to do so. Could this favorable change have been a coincidence? The most remarkable permanent recoveries from arthritis that we have observed have followed cases in which the restoration required full dentures. It is quite possible that, in some cases, when there is no change following the extraction of the pulpless teeth and painstaking medical examinations fail to locate the primary focus, such negative results are often due to unobserved degeneration. We suggest that, in such cases, all teeth, especially those with large restorations, be thoroughly tested for pulp conditions.

The number of times that we have observed cases in which pulpless teeth have been extracted and followed with elaborate live abutment bridgework and that later developed slow degeneration accompanied with marked secondary effects makes this subject of more than passing interest to us.

In another case, interesting because the patient is a dentist and a student of the pulpless tooth problem, there was an inherited predisposition to arthritis. In an effort to avoid the disease, two pulpless upper bicuspids were extracted, and a fixed live abutment inlay bridge was placed from cuspid to molar. The molar gave trouble from the beginning and so the patient used only the opposite side for the mastication of food. A few months after the bridge had been placed, a small new cavity was discovered on the mesial surface of the upper second molar adjacent to the bridge, probably due to abrasion resulting from the cavity preparation of the bridge. The patient desired a small alloy filling, but the operator, from one of the finest offices in this country, insisted on an inlay restoration, with extension of the margins to areas of immunity, etc. The operator had his way, and the pulp was anesthetized for a demonstration of a painless cavity preparation, and the inlay in due time was cemented in place. This tooth, without previous filling, was quite painful for several days, but finally it gave but a little trouble, and after six months it was found vital on test and was considered in good condition. Two years later, it became necessary, during a period of overwork and lowered resistance, and because of dental trouble on the opposite side, for the patient to shift the mastication of food to the bridge and inlay. These teeth developed a slight soreness the first day, but this was attributed to their long period of disuse in mastication. The patient developed a severe myositis of the muscles

of the neck, which moved down to the gluteal muscles on the second day and which was so severe that he had to remain in bed, in one position, for a week. Thereafter, the more acute symptoms disappeared, and the patient was able to get around, with much difficulty, for about a month, when, still not suspecting the teeth, he developed a severe pulpitis in the second molar with the inlay. The tooth was opened through the inlay, and a sedative dressing sealed in, which relieved the pulpitis. This was treated for several weeks more with but little inconvenience as far as the tooth was concerned, but the myositis of the back was still severe enough practically to incapaciate the patient. Finally, it was decided to remove the coronal part of the pulp, which was found vital in both buccal roots but putrescent in the lingual root. The buccal roots were then temporarily capped and the lingual root was treated with beechwood creosote. The next day, all the back pains disappeared, and for the first time it dawned on the two dentists that the tooth might have been responsible for the myositis. The patient was then willing to submit to tests for further study of the case. He was interested to know how long he would be able to prevent recurrence with the two buccal roots capped and an antiseptic filling in the lingual root. Early in the treatment, it was found that delayed change of treatment caused recurrence of the myositis. Unfortunately, the inlay was removed to better fill the canal, and, as a result, several months after the root filling, the cement restoration failed to protect the weakened crown sufficiently and the tooth fractured so that it had to be extracted. Two years have passed, and the patient has been in excellent health.

We have several reasons for presenting this case. It is typical with respect to symptoms and it illustrates very well the dangers of too extensive cavity preparation, it gives evidence of the quick response to suitable treatment, and, finally, we are reminded of the fact that not all of our service that has proved unsuccessful from the health standpoint has been the result of inferior dental work, for the several operators who so desperately held to the approved methods were indeed teachers of the science and art of dentistry. The patient is now a candidate for a full upper denture as a result of the loss of the two bicuspids four years ago. This case is quite typical of cases that come to our attention.

We have at the present time, two cases diagnosed as corneal keratitis. Both patients are in excellent health otherwise; in fact, they are perfect physical specimens. We will not go into detail here other than to point out the importance of more positive diagnostic methods. One of the patients came to us from the hospital with the assurance that every possible focus had been ruled out with the exception of the teeth. The patient, a woman of 20 years, was fast losing the vision of the left eye. All of her teeth were vital with the exception of the first molar on the side of the affected eye. This was extracted at once because of the seriousness of the condition, with negative results both clinically and bacteriologically. The eye specialists insisted that the teeth must be responsible so we started a process of elimination and finally, after the extraction of one pulpless tooth and pulp extirpation of another, the patient remembered that a dentist had capped a nearly or completely exposed pulp on the upper first bicuspid. The tooth was found to be inoperable by present root-canal methods and was extracted. At once, the condition changed to the favorable side, and after several months, the seven opaque areas have been reduced to two and they too seem to be resorbing, as shown from the record of the eye specialist. There may be recurrence in this case, but we, including the specialist, are quite sure that it will not be the case.

As a result of our limited means of diagnosis, we do know that the patient lost two serviceable teeth before the right one was discovered.

Vital Pulp Protection.—The newer problem demands immediate measures for the protection of vital pulps under all kinds of fillings and restorations. Five years ago, when an entire session of the Dental Faculties Association was devoted to papers answering the question as to what to do in the several departments of operative dentistry to prevent dental caries, we raised the question as to what could be done to protect pulps under various forms of restorations. There was a prolonged discussion and an interesting exchange of views. The operative departments recognized the significance of the problem, and all agreed that the subject should receive immediate study, but nothing as far as I know has been accomplished since, other than the accumulation of evidence proving the necessity for pulp protection, and its acceptance by many operative dentists. From the experimental standpoint, it is quite evident that the ends of freshly cut protoplasmic processes of the dental tubules should be treated and protected before the insertion of fillings and restorations. There is every reason to believe that the pulps have tolerated the foil fillings because the cavity had to be clean and dry at the time of the filling. The antiseptic value of the alcohol used may have served another purpose than that of a detergent. Protection of pulps from infection, intoxication and thermal changes where extensive cavity preparations are required is recognized by all operators, but is not practiced so extensively as it should be in view of the general knowledge of its importance.

Research.—During the past fifteen years, as a profession we have improved our status tremenduously as a result of intensive research. We have, as a profession, a better appreciation of our problems, but with such appreciation we have also become conscious of the inadequacy of many of our past practices. Research in conjunction with clinical experience should accelerate the desired refinement of dental practices.

Increased vigilance on behalf of the children will relieve the situation to a certain extent. More painstaking practice will relieve it still further, but finally, to be most effective, better organized and systemized research should pave the way to improved methods of operation and give the whole profession the fundamentals of more effective health service.

POSTOPERATIVE TREATMENT*

By ERNEST W. BROWNING, D.D.S., Salt Lake City, Utah

THE alleviation of pain for suffering humanity is one of our paramount duties, and therein lies our rôle as one of man's greatest benefactors. Any postoperative treatment that will minimize pain is worthy of our utmost consideration; for, after all, the success of the operation, in the eyes of the patient, depends just as much on the lack of pain after the operation as during the operation itself. With our present-day knowledge of operative technic and surgical refinement, the presence of postoperative pain, except in a few isolated cases, is an admission of faulty technic or negligence.

Having long since discovered that men in different parts of the world get the same results with different methods, my endeavor will be not to present something new, but rather to review a few of the treatments employed in our office, hoping that some little thing we do may benefit some one else.

It has become routine practice to advise every patient of the importance of paying strict attention to the bowel movements after the operation. This seldom necessitates the administration of a cathartic. Strict attention to diet will regulate the most stubborn case of constipation. If the patient is not accustomed to laxatives, nothing will undermine his resistance so quickly as the use of them. If the body's elimination becomes stagnant, healing in the mouth will be delayed. Naturally, after mouth surgery, the patient cannot partake of coarse foods. The diet should consist of fruit juices given three times daily. Nutritious foods, such as soft eggs, custards, cooked cereals, milk, cream, creamed soups, and eggnogs together with puree of vegetables to supply the necessary ballast, will cause the bowels to move normally. If the patient is not inclined toward constipation and yet experiences some difficulty after the operation, an enema of one to one and one-half pints of warm water is preferable to a cathartic.

No matter how simple the operation, each patient is called the following day and the exact condition ascertained. The secretary is trained to answer nearly all questions, thus saving much valuable time. Besides keeping us in touch with any complications that may arise, it has a most beneficial effect on the patient. We are all interested in our patients, but why are we so lax in letting them know that we are interested?

In the event of pain existing, the patient is advised to place hot epsom salts packs on the face over the area of operation. If this does not give immediate relief, he is requested to take a sedative. If relief is not then obtained, the patient is instructed to get

*Read before the American Society of Oral Surgeons and Exodontists, Philadelphia, Pa., Aug. 21, 1926.

in touch with the office immediately. Pain from dental operations does not persist over a long enough period of time to allow any one to become a drug addict; therefore, we do not hesitate at this time to prescribe a narcotic.

All patients are advised to use as a mouth wash a solution of hot green tea. One of our patients who was a heavy tea drinker returned on the third day after an alveolectomy with a beautifully healed mouth and reported experiencing absolutely no pain. On being questioned, she informed us that she had used nothing but hot green tea. The next patient was advised to use this treatment, the result being the same. It is now routinely prescribed, with most gratifying results. Tannin, being an astringent, naturally assists in the healing of the wound. Being also a hemostatic, it prevents secondary hemorrhage, and in turn, the blood clot is prevented from disintegrating too soon, which minimizes the occurrence of dry sockets. Used hot, it stimulates the tissues and assists Nature in healing.

As trauma produces more postoperative pain than any other cause, our first objective is to traumatize as little as possible during the operation. This is accomplished by a refinement of technic. Naturally, as we become masters of technic, the need for postoperative treatment lessens. But even with every detail carefully observed, we continue at times to have dry sockets, calling for postoperative treatment.

Dry sockets generally occur in patients with a lowered resistance, or when the osseous tissue surrounding the tooth has become infected or is lacking in nutrition. They cause more intense pain than any other condition we are called on to treat, and sometimes occur when we least expect them. After trying almost every medicament known to the healing art, the most gratifying results have been obtained with a preparation consisting of a powder of zinc oxid and rosin, and a liquid, the chief ingredients of which are oil of cloves, olive oil and leptinol. It is essential that the zinc oxid be tested, as it must be absolutely free from arsenic. The socket should first be washed out with physiologic sodium chlorid solution and allowed to fill with blood. No curetting should be done at this time. The pack is mixed thin, and a piece of sterile gauze about one-half the width of the socket and about one-half longer than the depth of the socket is worked into the mix and applied lightly, the surplus resting on the socket. Care must be taken not to pack tightly or to mix the pack too thick. Relief has been obtained in every case in no longer than thirty minutes. The pack may remain in the socket from two to seven days with perfect comfort to the patient, and it is seldom necessary to place a second pack.

CONCLUSION

It is our duty to put forth every effort to eliminate postoperative pain. If you are satisfied with your results and have conquered this evil, continue with whatever your treatment may be. But if you do have difficulty and are not satisfied with your results, bend every effort to eliminate pain. Nothing will build a practice quicker than this very thing. Nothing is more indelibly impressed on a patient's mind than the presence or absence of pain. And nothing but the elimination of pain will bring us patients without that trembling fear that accompanies the visit of at least 90 per cent of our clientele.

Remember, at all times, that our patients can and will get relief "just around the corner."

DISCUSSION

Edward L. Moravec, Cedar Rapids, Iowa: The subject of postoperative pain and postoperative treatment has long been, and still remains almost the paramount problem in exodontia. It is true, as Dr. Browning states, that we are classified as exodontists according to our ability to alleviate pain more than to our skill as an operator. The treatment which Dr. Browning most highly recommends, namely, green tea, is a "grandmother" treatment; but for what have we more respect than grandmother's opinion, gathered over many years of experience and pain, and care of the suffering? Since receiving this paper in my office, preparatory to writing a discussion, I have been recommending the treatment, with very gratifying results, and I am glad to recommend it further. As a sedative, I am using a number of the most staple and well-known drugs, most of which are familiar to those present. The subject of postoperative pain and postoperative treatment was well covered. Nothing was said of postoperative hemorrhage. May I present one case of particular interest? A woman, aged 49, the mother of two grown children, had eighteen teeth remaining in the mouth, with very bad pyorrhea. Extraction was recommended by a physician and approved by me. On the first observation of the patient, I did not like the general appearance, the color of the skin and other signs. On careful questioning, there was no contraindication to extraction. However, I decided to remove only five teeth, under nitrous oxid-oxygen. Slight bleeding followed, for approximately two hours. This cleared up, and the patient was dismissed, returning in three weeks and reporting everything favorable. I then decided to remove the remaining teeth, six anterior above and below. Extraction was completed and everything was perfectly normal, the patient resting, while waiting for relatives, for about two hours. The bleeding ceased, but started again, increasing rapidly. An effort was made to control hemorrhage in the office by the well-known methods, with no avail. The patient was removed to hospital, and a number of doses of fibrogen were administered. Pressure was applied to the gums or sockets, and finally each socket was packed in gauze saturated with tannic acid and epinephrin, with pressure added, and digitalis hypodermically. In the course of twenty hours, 38 c.c. of fibrogen was added, per mouth and hypodermically, besides local pressure being employed, and all other remedies known, before bleeding was stopped. The patient was very pale, pulse 160, temperature 102 F. after twenty-four hours. Recovery was very slow, extending over a period of six weeks. After this experience, I learned the history, which she denied me at the time, part of which was as follows: Six years previously, going through the Mayo Clinic, she was given six years to live, having a disease called erythrocytosis, or increase of red blood cells. She went to Chicago to the Presbyterian Hospital, and there the same diagnosis was made, with the recommendation that the spleen be removed, which she did not have done. However, she followed the advice of having a pint of blood removed about every two or three months, which she continued to do for about five years. The object of citing this case is its particular interest, and in order to emphasize the importance of the history of our patients.

THE TONSILS AND THEIR POSSIBLE RELATION TO THE ERUPTION OF THE MANDIBULAR THIRD MOLAR*

By M. F. WIELAGE, D.D.S., Miami, Florida

THERE is no doubt that the individual cells of the body possess an intelligence of their own. Such properties as metabolism, growth, motion, irritability and reproduction, as well as selective action, entitle them to be the original building stones of the organism.

Through eons of time, their close association with similar cells brought out the fact that there was strength in unity. Their combined intelligence directed the specialization of certain cells for the benefit and progress of the colony. The reproduction of these specializing cells, always under the direction of intelligence, brought into being the different organs with their special function; each one serving the needs of the whole to the best of its ability and equally depending for its existence on the proper functioning of other specializing organs.

In the human body, we have the product of countless experiments, of trials and errors, of an endless search to preserve the existence of this mighty colony of cells in continually changing surroundings. May we not assume that, for the moment, the normal special organs have attained the acme of perfection for the existing conditions? Every organ has assigned to it certain duties, to serve the whole organism or to assist the functioning of other organs, whether we are acquainted with its function or not.

Some of the cells of the body are active workers, manufacturing the secretions and fluids needed in the varied work of the system. Others belong to the reserves, awaiting the call of duty in the case of an emergency. Some cells are stationary; others are constantly moving about. Some are carriers; some are movers. Others are employed on the police force of the body or else constitute the cell army.

The work of the cells in repairing a wound furnishes one of the most striking illustrations of the presence of intelligence in the cells. The cells of the tissues, nerves, blood vessels, etc., on each side of the wound, begin to reproduce themselves, systematically and with a purpose. The cells of the blood vessels connect with the same kind of cells on the opposite side, connective tissue cells with connective tissue cells, etc. Like seeks like. Truly, a marvelous display of coordination and intelligence.

Arthur E. Smith in his "Block Anaesthesia and Allied Subjects" says: "We have no certain knowledge of the function of the tonsil; neither does its

*Read before the Miami Dental Society, Feb. 14, 1927.

presence seem necessary for good health. Its complete removal does not in any way appear to be injurious, so there should be no hesitancy in removing diseased tonsils."

If we have no certain knowledge of the function of the tonsil, we should always strive to solve its mystery. If we have been unable to find out what the function of the tonsil is, we may also have been unable to grasp the necessity of its presence for good health.

Radash, in his histology, states:

> The tonsils are found just between mouth and pharynx and are essentially lymphoid structures; under the anterior pillar of the fauces seems to be an area, corresponding to a hilus. Here most of the vessels seem to enter and leave. The bulk of the tonsil consists of lymphoid tissue in the form of the diffuse variety and solitary nodules. The latter show germinal centers and are found chiefly around the crypts. The supportive tissue is of the retiform variety. Leukocytes are chiefly small lymphocytes and hyaline cells.

The tonsil, therefore, seems closely related to the lymphatic system, and its function could be sought for in that direction. If we now consider the location of the tonsil and its lymphatic connection with the different submaxillary lymph nodes, we can imagine it placed at the apex of a pyramidal lymphatic structure, horizontal in position. At the same time, its proximity to the outside of the body should be observed.

Before we proceed, I want to touch on the subject of dentition. We are all acquainted with the approximate time of eruption, and we know that the period of eruption of the third molars is an irregular and often times lengthy one. (I have taken the third molar as an example, though the same disagreeable phenomena are present in dentition in general.) The condition of the maxilla and the mandible in the area of the third molars is worth noticing. In the maxilla, the surface to be pierced is convex; in the mandible, we have a concave surface. The more dense condition of the bone in the latter is readily understood and will partly explain the difficulties of the painfully erupting mandibular third molar. This process of eruption is always accompanied by inflammation, osteoclastic and osteoblastic action, etc., with the usual complications so well known to dentists, the presence of infection playing no small part in its uncomfortable progress.

The whole organism becomes liable to invasion, were it not for the barriers of specializing cells in the form of leukocytes and, last but not least, in the form of lymph nodes, which we find as three marked layers of defence, closely connected, the lymph playing an important part.

Lymph is diluted and modified blood plasma, a clear colorless albuminous fluid, containing white blood cells and lymph cells, the latter from the lymphatic glands. The quantity formed depends on the increase of arterial pressure and hyperemia of the part after digestion, the quantity of water in the blood and the permeability of the vessel walls. It supplies the tissues with pabulum and carries away waste matter. This lymph is filtered in the lymph nodes, which take care of infectious material and micro-organisms which have escaped the leukocytes, preventing the infection from entering the circulation.

There is a possibility that, somehow, any excess of infectious material may be sent through the tonsil, acting as a safety valve, to the outside of the organism. Tonsillar involvement during

the painful eruption of a mandibular third molar (and with the eruption of teeth in general) is often noticed.

REPORT OF CASES

CASE 1.—A man, aged 39, complained of discomfort in the region of the left mandibular third molar. He had had a running ear on the left side for about three years, the discharge being continuous during the night but not during the day. He had been treated for the ear condition unsuccessfully. There was marked pain in the region of parotid gland when the ear was irritated. The submaxillary lymph nodes were palpable. Four years previously, the same condition existed on the right side. The tonsils had been removed previously. The patient remembered that after the third molar on the right side was removed, the ear stopped running after a number of weeks, but he had not connected the two incidents. I advised the removal of the left mandibular third molar. The date of removal was Dec. 16, 1926. Feb. 3, 1927, the patient reported improvement of the condition. February 15, the ear had ceased running entirely. The question arises: Would running of the ears have taken place if the tonsils had not been removed?

CASE 2.—A man, aged 29, complained of a painfully erupting third molar and sore throat, present off and on for the last three years. A physician advised removal of the tonsils. Three weeks after tonsillectomy, inflammation in the area of the left lower third molar became acute. The tooth was removed, Feb. 1, 1927. Recovery was uneventful.

The tonsils were removed before complete eruption had taken place. The avenue of escape was cut off and the condition around the third molar became acute.

To arrive at any positive conclusions, many more data will have to be collected. The dental and medical profession as a whole could gather sufficient information, if the investigation was directed toward the possible relationship between tonsillar infections and painfully erupting third molars. Often, the attention of the dentist is called to this latter condition, and if his observation was extended to the presence or absence of the tonsils, or to an involvement of one or both tonsils, we would soon be able to gather some valuable information. This could be obtained from the eye, ear, nose and throat specialist by extending the examination to the third molar area and teeth.

If this relationship could be proved, the tonsil would take its place as a useful organ and would be treated as such in the future.

The correct answer to a number of questions would be very interesting. For instance:

Should the tonsils be saved until all teeth are properly erupted?

If conditions warrant the removal of the tonsils, should the impacted or partially erupted third molar be removed prior to tonsillectomy or shortly after?

If the tonsils have been removed, is it not advisable to remove partially erupted third molars at the first indication of a disturbance in that area?

I have not been able to find any data on this possible relationship, and a cooperative effort of the medical and dental professions may lead to some startling discoveries.

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MINIMIZING PAIN*

By W. P. SMEDLEY, D.D.S., Denver, Colorado

IT is not the aim of this paper to suggest that pain can be, or that it is even desirable that it should be eliminated from the practice of dentistry. Pain is not an unmitigated evil, as most of our patients pretend to believe, but, on the contrary, is a useful function of the nerves contained within the pulps of the teeth and the investing tissues. Nevertheless, valuable as it is as a diagnostic guide to the dentist, and as a warning and a driving force for the patient, there should no longer be enough pain caused by any dental operation to afford an excuse for the time-honored jokes about the dentist and his "torture chamber."

The baneful effects of pain and the fear of pain are indeed far reaching. Not only is the dentist hampered in his work because of a "moving patient" and the completeness and efficiency of his operation curtailed because of the limitations of patients in bearing pain, and, reflexly, his own limitations in inflicting pain, but, what is far more important, the dread or fear of pain keeps many potential patients from the dental office until pain finally drives them to it; when it is always too late for prophylactic treatment, and is frequently too late for desirable constructive treatment. The fear of pain nullifies the dentist's greatest potentialities, when he is thus forced into the position of having to treat sick teeth which can never be well, rather than affording him the opportunity to treat well teeth so that they may never be sick.

The fear of pain has long been capitalized by the charlatan. His method of making good his alluring advertisments has been by the application of arsenic to healthy pulps or dentin, or by placing filling material in a slightly prepared cavity, enclosing a mass of carious dentin, which more slowly, but just as inevitably, continues to decay to the ultimate destruction of the pulp and the tooth; or still worse, by covering a tooth with one of his abominable gold crowns. By leaving undisturbed any carious dentin that might be present and dividing the grinding between the tooth to be crowned and the adjoining tooth, space for the band is obtained without reaching the dentin, and the advertised painless operation is achieved. To be sure the gingival irritation surely established, and the traumatic occlusion almost inevitably produced, assure plenty of pain eventually, and the loss of the tooth at a no very distant date. The methods of the quack have always been so distasteful to ethical dentists that many of them have seemed almost to pride themselves on not doing "painless" dentistry.

*Read before the Section on Operative Dentistry at the Seventh International Dental Congress, Philadelphia, Pa., Aug. 25, 1926.

It is to be deplored that, while anesthesia was first introduced by men of our profession, dentistry has lagged sadly behind the medical profession in its efforts to relieve patients of unnecessary suffering; and while Dr. Wells introduced nitrous oxid in 1844 and Dr. Morgan followed with ether in 1846, it has not been until very recent years that any considerable proportion of the dental profession has really made a conscientious effort to abolish needless pain. It would seem, moreover, that even yet there remain many dentists who neither know nor care what has been accomplished along the line of anesthesia, and, because it is almost impossible thoroughly to excavate a cavity when the tooth is extremely sensitive, even though the patient may endeavor to stand it, much carious dentin is left by these ethical men; with only relatively less disastrous results than that of the charlatan.

HISTORY

The effort to relieve pain is no new thing. Guerini, in his "History of Dentistry," assures us that the minimizing of dental pain was treated in the Ebers papyrus on the seventy-second page. He tells us also that some of the writings of which the Ebers papyrus is composed date back to 3,700 years before the Christian era. To be sure, the herbs and incantations which were used at that time were not employed to minimize the pain of dental operations but to minimize the pain of dental disease.

The historical aspects of the subject may be considered in three phases: (1) minimizing pain by prevention of extensive dental disease; (2) minimizing pain during dental operations; (3) minimizing postoperative pain. The first of these is what we are pleased to call "preventive dentistry." We may think that "preventive dentistry" is a relatively new thought, but on page 89 of the same papyrus, we find a prescription for a remedy, "To strengthen the teeth;" i.e., to render them less liable to disease. The second, minimizing pain during operations, is undoubtedly of less ancient origin, since Guerini says, "One finds no mention of dental surgery in the Ebers papyrus."

Dental art in Egypt had made remarkable progress by the fifth century before Christ, and, in all probability, dental operations were performed before that time. We may assume, therefore, that some effort was made as early as this to minimize pain during operations, because patients were probably not much more heroic at that time than now. In speaking of filling with lead, Fauchard says, in his book which was written in 1723, "If the sensibility of the caries be too great, the lead ought only to be pressed very lightly at first, then after one or two days a little more, continuing until it is properly compressed or fitted in, always provided, of course, that the pain does not increase." This, you see, is minimizing pain during dental operations. Minimizing postoperative pain is treated by the same author, his final treatment being extraction.

We now come to the consideration of three phases of present-day practice in minimizing pain.

1. Minimizing Pain by Prevention of Extensive, or Any, Dental Disease.—Minimizing pain for the child by starting with the expectant mother seems a far cry, but it is the logical place to begin. While we cannot hope to overcome entirely the trend of generations, the mother can, by living on a diet rich in

mineral salts, provide enough of the needful salts to build up the bony framework of her unborn infant and start well-calcified teeth and do so without robbing her own system. She thus not only minimizes for the child the liability to caries, and the pain incident to it, but also renders her own teeth less liable to the caries which so frequently accompanies pregnancy. If it is at all possible, the infant should be breast fed, and, when a few months old, should have orange juice and vegetable water added to its diet. As the child grows, it should have a diet with a goodly portion of milk and a substantial amount of fresh fruits, green vegetables and whole-wheat bread. This, together with plenty of exercise and fresh air and sunshine, along with mouth cleanliness, will certainly minimize pain for that child, by decreasing the necessity of dental operations.

Another way in which mothers may help to minimize dental pain for their children is to refrain from instilling into their minds a horror of dental work. A fear that may never be entirely outgrown is often established when the child "listens in" while mother and her friend try to outdo each other in relating terrible experiences at the dentist's. This, supplemented, perhaps, by an occasional threat to take him to the dentist if he doesn't behave, goes a long way toward making big cavities out of little ones.

Present-day orthodontia, with its results of producing normal occlusion, is a potent factor in minimizing pain; for we all realize that teeth in normal occlusion are much less subject to caries, traumatic occlusion and periodontoclasia.

Prophylaxis, at the hands of the dentist, together with scrupulous care of the teeth by the individual, while not producing 100 per cent immunity from caries, will undoubtedly reduce the amount. The work being done by Dr. Bunting at Ann Arbor seems to offer hope in the matter of the control of caries and minimizing pain through prevention.

The roentgen ray, used as a diagnostic agent, is a valuable aid in minimizing pain; for it must be admitted that one of the best ways to control pain in dental operation is to control the necessity for extensive operations, and it is in this rôle that the roentgen ray can play one of its most important parts. It discloses incipient caries at contact points, under marginal gingivae and under fillings, before detection is possible by other means. The early discovery of caries, of course, obviates the necessity of excavating deeply toward the pulp in the preparation of cavities, and it precludes the necessity for as large a metallic filling in a given case; all of which tends to minimize pain during the operation and subsequently thereto. If there is an objection based on time or expense of films, this objection may be largely overcome by the use of the interproximal films suggested and perfected by Dr. Raper.

2. *Minimizing Pain During Operations.*—This phase of the subject is the most appealing to our patients, if not the most important. The earlier efforts were confined almost entirely to tooth extraction, the general anesthetics, nitrous oxid, ether and chloroform being the agents available. Nitrous oxid, the first substance used to produce complete insensibility to pain, is still the most useful of the group, despite many vicissitudes. After the introduction of

chloroform in 1847 and the death of Dr. Wells in 1848, its use was largely abandoned for nearly twenty years, when it was reintroduced and came into quite general use, and it has never since entirely lost its place, in spite of the advent of ethyl chlorid, cocain, somnoform, procain and many others. The comparatively recent use of oxygen in combination with it has, of course, greatly enhanced its value and widened its field of usefulness. For years, many dentists with a sympathetic nature and a proper understanding of the importance of the thorough removal of all trace of caries have made a persistent and conscientious effort to desensitize dentin without resorting to general anesthesia. Numberless efforts were made, and many of the methods are still useful, and should be used in given cases, in spite of the unquestioned efficiency of the procain injection, either by block, infiltration or interosseous method. Sharp instruments, skilful technic and good psychology in many cases are all that is required, but, in many more cases, they are quite futile. Thorough dessication of the cavity has proved helpful, as has also working under a stream of water at 115 F. Many methods were tried to force cocain, and later procain, into the dentin. They have been used with some success when incorporated with essential oils; and when dissolved in acetic ether, considerable penetration is gained. Cataphoresis as a driving force had its day, followed by the use of the Wilcox-Jewett and other high pressure syringes. These served very well when properly used.

Various desensitizing pastes were quite freely used for a time, but their use has been largely discontinued because of the detrimental effect on the pulp. Chloroform analgesia has been used with some success for many years, and nitrous oxid and oxygen analgesia had quite a vogue a few years ago, as a result of an active selling campaign by manufacturers.

The introduction of procain, by Dr. Einholm in 1905, gave us a safe and thoroughly satisfactory substitute for the treacherous cocain and made the block anesthesia, as reintroduced into this country by Dr. Fischer in 1913, a real boon to suffering humanity and the profession. Dr. Smith's masterpiece on the subject of anesthesia, supplemented by writings by many other men, notably Dr. Posner's primer recently published, leaves no plausable excuse for any dentist to cause his patients serious pain during dental operations.

The mandibular injection is conceded by all to be the only effective means of anesthetizing the mandibular molars, and it is the best for all the mandibular teeth, with the possible exception of the incisors, which can be quite readily handled by infiltration. The zygomatic or tuberosity injection is simple and is the most efficient means of anesthetizing the maxillary second and third molars, and sometimes the first molar. The other maxillary teeth can be readily anesthetized by the supraperiosteal injection over the apex of the root. To avoid the disagreeable sensation in the lip and cheek incident to the infiltration method of anesthesia for the maxillary incisors, cuspids, bicuspids and first molars, and to obtain immediate anesthesia, the interosseous injection, as advocated by Dr. Griffith some years ago, is simple and very satisfactory. This is accomplished by injecting a drop of procain solution in the septal gum tissue, then using the same opening,

reaming through the outer plate of process and the cancellous portion of the alveolus to a point near the apex of the root, using a twist canal reamer with thumb and finger. The needle being reinserted, a very small amount of procain gives immediate anesthesia, and if, as is possible in making a porcelain jacket crown preparation, the operation should outlast the anesthesia, it is simple to add a few drops of procain through the same opening. There is little or no discomfort or after-pain from this method. To be sure, injury of the pericementum will cause after-pain, but there is no excuse for such injury with the radiogram to guide us.

In many cases, pressure anesthesia is the most efficient method and should be used in preference to an injection. Where access may be had to healthy dentin, without needless destruction of tooth structure, as in an occlusal pit, which is to be included in the ultimate cavity, it is an ideal method. A small pit is drilled into sound dentin where pressure can be applied directly toward the pulp against the ends of the freshly cut dentinal tubuli. A short cone-shaped piece of baseplate guttapercha is attached to the end of a stiff plugger, about the same diameter as the bur used in drilling the pit. The pit is filled with a saturated solution of cocain, the tip of the guttapercha point is softened in the flame and pressed into the pit. The stiff portion of the guttapercha backed up by the plugger serves as a plunger to force the anesthetic through the tubuli. Underlying secondary dentin would prevent complete success. This method is particularly applicable to gingival cavities where the pit can easily be drilled through into sound dentin. The momentary pain caused by drilling into the dentin only makes the patient more keenly appreciative of the total absence of pain thereafter.

Some men, in their enthusiasm for the use of procain, are prone to employ it in injection in all cases as a routine practice, thus losing the diagnostic value of sensation in the tooth, and frequently injecting to the annoyance of the patient without justification. An injection should never be made until both the patient and dentist are convinced that more discomfort will be avoided than caused by the procedure.

The roentgen ray comes into play in this second phase by showing the size and contour of the pulp, so that encroachment on it can be avoided in forming cavities, preparing for bridge abutments, jacket crown preparations, etc., thus discounting the excuse offered by many for not using anesthesia for this purpose. It also well shows the relation of caries to the pulp in proximal cavities, so that proper protection can be provided.

Pain, other than that in the teeth themselves, may be inflicted in many ways by the thoughtless or careless operator. The careless application of mechanical separators, carrying rubber dam too far under the septal gingiva, the use of misfitting clamps or misapplying the right clamp, the unskilful use of ligature, all inflict pain, and moreover cause permanent injury to the soft tissues and perchance the teeth.

Much discomfort can be avoided in gaining access to the posterior teeth by reaching into the mouth and drawing the tissues outward and backward instead of placing the thumb, finger or mouth mirror in contact with the skin and rolling the tissues inward, as is too often done. A chafing of the skin and

actual sores at the corners of the mouth often result from this carelessness. A great deal of irritation to the lips and that portion of the face to be subjected to undue stress can be avoided by lubricating them with an ointment of sterile petrolatum (vaseline) and bismuth subnitrate, i.e., petrolatum heated to 112 F., with 33 1/3 to 50 per cent bismuth subnitrate added; a formula suggested by Dr. T. J. Gallaher of Denver. This can be kept convenient for use in a collapsible tube. It is particularly helpful when taking full plaster impressions.

Perhaps, with the exception of procain, the agent which has afforded the greatest comfort to patients in our practice is a sedative cement which we have used in practically the same form for more than twenty-five years, the ingredients of which are eugenic acid, thymol, iodin, zinc oxid and bismuth subnitrate. With its use as a capping material, the normal function of practically all of the fairly healthy exposed pulps has been preserved; not only the pain and annoyance of pulp extirpation and canal filling being avoided but also toothache or focal infection and its almost limitless train of painful sequelae; extraction, replacement, etc., that would have been the inevitable result of our share of the root canal failures. This preparation has made pulp conservation practically as safe and sane a procedure as any other dental operation, especially in view of the fact, which has within recent years been indisputably proved by Dr. Noyes and others, that dental pulp tissue contains a complete system of lymphatics and consequently has the same recuperative and eliminative capacity as other tissues of the body.

Because of the soothing and non-conducting properties of this sedative cement, it is desirable as a lining of practically all cavities. If the pulpal walls and the undercuts are thus filled when the cavity is prepared, the pain incident to the removal of a temporary filling and the cementing of an inlay at the subsequent sitting is largely avoided. In cavities which are not deep enough to permit of a permanent layer of this cement being placed at the first sitting, it is well to use as a temporary filling this same material with the addition of from 10 to 15 per cent of resin. Mixed with cotton or asbestos fibers, it may be used to advantage as a pack around the necks of sensitive teeth after the surgical removal of gum tissue for the elimination of pyorrhea pockets, as a pack in open sockets after extraction and for the protection of roots that have been prepared for crowns. A thread of cotton impregnated with this paste and placed carefully on the gingival seat prepared for a porcelain jacket before the placing of a temporary crown of silicate cement affords complete protection to the gingival tissue and to the sensitive dentin typical of this portion of the tooth.

3. *Minimizing Postoperative Pain.*—Postoperative pain is ordinarily thought to refer to the pain following a surgical operation, but it should and does just as truly refer to pain, or even what is called discomfort, which so frequently is a sequence to restorative operations. Minimizing postoperative pain consists of doing most of the things mentioned under the first two headings, and, in addition, some things now to be mentioned. Postoperative pain in the surgical field can be largely avoided by skill in the operation, the use of sharp chisels, to avoid crushing bone, and care-

ful manipulation to avoid bruising and lacerating the soft tissue, thorough removal of sharp edges and loose particles of process and all soft tissue unavoidably crushed or lacerated. Administration of analgesic drugs, use of high frequency current, are each and all important in minimizing postoperative pain. Here again, in this third phase, the roentgen ray is valuable, not only in avoiding undue injury during difficult extraction but also in locating the cause of any after-trouble.

When working under a nerve block or any other form of anesthesia, the same caution should be exercised to avoid undue injury to either hard or soft tissues as would be used were the tissues not anesthetized. This is particularly true in the matter of the generation of heat, by too rapid drilling or use of a dry stone or sand paper disk. The inquiry caused under these conditions is as productive of postoperative pain as any part of the operation.

It is all too common a practice for dentists to ignore complaints which are not extremely insistent. The patient is put off with the assurance that "it will be all right when you become accustomed to it." Patients are only too willing to forego further grinding to adjust occlusion, further filing of an overhanging margin, deeper scaling of a periodontoclasia pocket or any other work which they think they can possibly get along without. Inlays, crowns and bridges are apt to be left in plus occlusion, because of depending on the patient's word that the occlusion is not too high. We must not depend on the patient's word but must test most carefully with articulating paper until the occlusion is unquestionably correct.

Careful removal of overhanging margins, cement and roughness of any nature will minimize postoperative pain.

SUMMARY

1. Pain is valuable as an indication of a pathologic process.

2. Pain, or sensation, is valuable as a diagnostic aid.

3. Pain should seldom, if ever, be inflicted by the dentist.

4. Minimizing pain is most truly and acceptably accomplished by prevention.

5. Accessory discomfort or pain, brought about by the dentist, is wholly inexcusable.

6. Present-day anesthesia should remove fear of the dentist's chair from patients' minds.

7. Prevention of postoperative discomfort or pain is quite as important as any other phase of minimizing pain.

DISCUSSION

Edward H. Bruening, Omaha, Nebr.: In summing up, Dr. Smedley said, "Pain or sensation is valuable as a diagnostic aid," and, in the next sentence, "Pain should seldom, if ever, be inflicted by the dentist." There are occasions when we must take advantage of the sense of pain and cause a painful sensation to aid us in arriving at a correct diagnosis of the case. This should be only momentary, however, and never of an excruciating nature; as, for instance, in the testing of pulps for vitality. Referring back to Dr. Smedley's first phase, "minimizing pain by prevention of extensive dental disease," allow me to call your attention to pits and fissures on the surfaces of teeth. We should examine the teeth of young patients with a binocular loupe to aid the eyes, a sharp pointed exploring instrument and a diagnostic lamp, and carefully dry the surfaces with an air syringe. These areas should be carefully filled (preferably with gold foil) with but little groove extension, or, in other words, several small fillings on an occlusal surface are much to be preferred to one large one. These can be prepared

practically painlessly by the use of "sharp instruments, skilful technic and good psychology or suggestion," as Dr. Smedley has stated. Under the heading, "Minimizing Pain During Operations," I want to emphasize the value of nitrous oxid and oxygen analgesia in many cases. It requires an extra assistant to operate the machine. The patient is requested to hold the cup in position over the nose and he may take as much as he needs to eliminate pain. He is told that he need not go to sleep, and that the whole matter is in his control. With this suggestion, he has confidence that it is not going to be necessary for him to suffer pain. If it becomes unbearable, many times he will not use the gas, but allow the preparation to proceed without the nervous tension that often makes operating so difficult.

P. V. McParland, Pittsburgh, Pa.: I have limited my discussion to those portions on which I am not entirely clear, or to those parts on which I do not agree. Pain, of course, is a valuable aid in the diagnosis of a pathologic condition, but I do not agree that it aids as a warning to the operator when he is approaching dangerous ground in cavity preparation. What the average dentist needs is a more thorough knowledge of the anatomy of the teeth, mouth and jaws. If we had this knowledge, plus the ability to keep our instruments sharp, all our operations could be made painless, because all the dentist needs, in addition to a better knowledge of anatomy, is a propor solution of procain, a definite technic of injection and the proper instruments to carry out that technic. I prefer Dr. Posner's technic, not only because of its simplicity but also because of its almost unfailing results. I wish that Dr. Smedley had stated his position regarding the administration of nitrous oxid and oxygen from the standpoint of the general practitioner for the minimizing or elimination of pain in dental operations. He intimates that it has a large field of usefulness, but he does not specifically say so. In my opinion, nitrous oxid anesthesia has no place in the average dental practice. With the necessarily limited facilities of the dentist to administer a general anesthetic in his office, and for the care of the patient, in case his condition should become bad during anesthesia, I cannot see the necessity for placing a patient in unnecessary danger, which is always present in the administration of nitrous oxid. I do not agree that the interosseous injection is either safe or desirable. With the added danger of carrying infection into the cancellous structure of bone, it is not safe, and the Posner technic makes the operation so simple that interosseous anesthesia is, in my opinion, not desirable. Placing a sedative cement between the cavity wall and the filling I do not believe is good practice, because it does not afford a reliable seat for a filling; more especially is this true if the intermediate filling is placed on the pulpal wall, since the stress brought about during mastication will eventually powder the cement and, as a consequence, the solid foundation which he should have at this point is lost.

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Editorial

THE DETROIT MEETING

As the time draws near for our annual meeting at Detroit, the magnitude of the event becomes more and more apparent. On several occasions, we have called attention to the importance of the 1927 meeting. Coming as it does in the year following the Seventh International Dental Congress, it will be the logical checking-up event for all the ideas and theories advanced at that great meeting. It will be the first session of national scope since the Congress, and it will bring together the leaders of dental thought in America. How much tangible good followed the Congress will never be known till the American Dental Association convenes at Detroit, and brings to its sessions the consensus of opinion of our clearest thinkers.

The stirring appeal of our President, Dr. Banzhaf, which he has so kindly written for this issue and which is made a part of this editorial, should prompt every one of our members who

are fortunate enough to read it to plan at once to attend the coming meeting. The devotion of Dr. Banzhaf to the best interests of the organization is one of the outstanding features of the present administration, and if for no other reason than to show loyalty to our President, the members should attend the meeting almost in a body.

Dr. Banzhaf's appeal follows:

A CONTRIBUTION TO ORGANIZED DENTISTRY

What is the ultimate goal of every member of the American Dental Association? What is he striving to accomplish by means of his affiliation with organized dentistry? Is he interested primarily in how he may profit personally?

Enthusiastic membership in the American Dental Association is one of the finest influences in the life of every dentist. It gives him a finer conception of his duties as a member of a profession that has for its purpose the prevention of disease and alleviation of suffering; it develops in him a more generous and kindly attitude toward his fellow men; it increases his capacity for service in behalf of the public; it inspires in him a greater understanding of those principles and ideals through which true friendship, unselfishness and a higher conception of life's duties are developed.

One of the things that I have discovered during the past year is that there are a great many members, many more than I at first thought possible, who value and appreciate their membership deeply and who are ever ready to give of their time and efforts for the benefit of the organization either directly or through one of its component bodies.

The growing interest in the affairs of the American Dental Association on the part of its members presages a record-breaking attendance at the forthcoming meeting at Detroit. As a result of the efficient work done by the section officers and the local committee on arrangements, the 1927 convention will be the most carefully organized, the most efficiently conducted, the best entertained—in short, the most important and instructive meeting that the Association has ever held and, as a result, I am certain, will attract an attendance that will exceed the attendance at any of the meetings in the past. In order that my statement may not be misunderstood as being boastful, let me state in explanation that it is but logical that the 1927 assemblage should be an improvement over former meetings just as it is to be assumed that we will continue to gain and develop by experience as the years go on.

You who are reading these lines cannot make a finer contribution than to keep yourselves informed concerning the progress in your profession and keep in personal touch with the thought and ideals of its leaders. In making whatever

sacrifice is necessary to this end, you are preparing yourself better for the discharge of your professional duties. It is your highest obligation as a worker in behalf of public health service to keep abreast of the times. Will you do your duty to yourself, to your profession, to your patients by attending the meeting at Detroit in October? I believe you will, if it is humanly possible for you to do so.

In closing, let me remind each one of the thousands of members whom I had the pleasure of meeting personally during the year that I am going to hold you to the solemn promises that you made to me either severally or collectively when you pledged me your attendance, enthusiasm and counsel at Detroit. I expect you, I need you, and I shall be looking forward to greeting you again. It is still possible to send in your hotel reservation if you have not already done so.

Such an appeal coming as it does from the highest officer in our organization should insure from our members a record-breaking attendance. The stage is perfectly set for this meeting, and let us all work to make true Dr. Banzhaf's prediction that it will be "the most important and instructive meeting that the Association has ever held."

THE SUCCESSFUL MAN

The successful man is he who by the greatest good gives the greatest happiness to the greatest number. He stoops to raise to its feet a fallen form. He prattles with infancy, romps with youth, walks arm in arm with middle life, and hovers tenderly over the infirmities of old age.

He calls every man his brother, every man his friend; and when brothers frown and friends prove false, he smiles benignly and still calls every man his brother and every man his friend.

He looks calmly in the face of adversity, and tries to see what good there may be in it. He cares little for the plaudits of the crowd, but if a child places its chubby, dimpled hand in his, he is happy. He gets his pleasures from the small things of life—out of a peal of laughter from a group of playing children—out of the smile of a friend he has helped—out of a tear of gratitude from some one whose pain he has eased.

He finds himself in tune with the great heave and throb of the universe—the rhythm and beat of time—the flotsam and jetsam of the stupendous forces of Nature, and the wierd, mysterious whirl of the eternal spheres.

He looks for the good in every human heart, and when the good seems smothered with the bad, he still looks for the good. His faith in humanity never falters, because he knows that in that faith there lies the germ of all philosophy.

He asks only for the pleasure of doing—only for the privilege of serving. To wipe a tear from the cheek of a tender babe; to force a smile where before there had been a frown; to change the agony of despair to the sunshine of hope; to smooth the rugged pebbly road for wearied feet; to press back a thorn from the briery path of life and let humanity walk serenely on; to do the gentle, thoughtful, loving thing and do it every day; to spread happiness and cheer and charity and good will and the very joy of life—this is all he asks, this is the acme of his ambition.

The successful man has learned that the only way to happiness is to make others happy; that the real ecstacy of living comes from seeing the light in the eyes of those one loves; that to warm the hearts of family and friends is to warm one's own; and that to smooth the pillow of some one else is to lie with easy head on one's own pillow at night.

He censures not when a fellow pilgrim has done wrong—he seeks to find the cause. He knows that behind every act there is a reason, and he is more interested in the reason than in the act. He tunes himself to the motives of men, and strives to change the motive when he finds that it is false. He judges not till he knows all the facts, and realizing how difficult it is to learn the facts, he hesitates to judge at all.

The successful man is not the one who never makes mistakes—he boldly casts his lot with his erring fellow man and accepts the buffets of fate with the same philosophy that he does

the favors of fortune. He sees the virtue of a shadow as well as the blessing of sunshine. He is one with all mankind and human in his heart, freely admitting his faults and frailties, and thankful if only "he may be right a reasonable part of the time."

He gives more than he takes and is made the richer thereby. He does a kindly act and hides it from the world, content if he may catch a fleeting glimpse of the light which his benefaction sheds.

The successful man is he who loves and is loved; who helps and is helped; who sows the seed and reaps the harvest; who plans and sees the fruition.

The elements of success in life are not deep, or elusive, or remote. They lie at every man's hand, and every man's hand may grasp them. But the fundamentals are inexorable, and no man may hope to be successful who is unwilling to pay the price. The price is fortitude, forbearance, forgiveness, charity, generosity, helpfulness, magnanimity, tolerance, loyalty, love and more love. Without love, no man can be successful even though he may conquer empires and sway destinies. Even if he ruled the whole world, he would not be successful unless he had in his heart the love that lights the lives of men and women and shows them the way to real happiness.

To be successful is to get in tune with the souls of humanity and the rhythm of Nature—to be one with the stars and the raindrop, the tempest and the zephyr, the ocean and the trickling rivulet, the mountain and the vale, the heroic battle of the elements and the hush and hum of Nature's drowsy twilight, the call of the mother bird and the chirping answer from the nest, the thunder of the orator and cooing of a tiny babe—the heights and depths of all the hopes and dreads of life, the joys and griefs, the thrills and ecstacies—the gamut of all the emotions, from the crooning, cradled lullaby in the morning of life to the dreamless sleep that presses down our eyelids in the eternal night of death.

SPIRITUAL VALUES IN SCIENCE

The task of discovering particular facts and general laws, of systematizing, classifying, correlating and interpreting has just begun. The astronomer is still engaged in studying the infinitely great. The chemist and the physicist are still investigating the infinitely small—the molecule, the atom, the ion, the electron. The botanist, the zoologist, the physiologist, the bacteriologist are still increasing the rich harvest of interesting phenomena concerning complicated life processes. The psychologist is still delving into the motivity of human action. The embryologist is yet unfolding the first chapter of genesis. The geologist and the paleontologist are still extracting history from the rock of ages. These accumulated treasurers, indeed, seem marvelous, and yet, as each year rolls by, we find ourselves, like Balboa, looking down from the mountain top, beholding an infinite and beautiful expanse, yet unfathomed. We feel with Sir Isaac Newton like children gathering shells on the shores of an infinite sea. The vista continues to widen, and new problems, new theories, new viewpoints, loom large before us. To quote Joseph Priestley: "In completing one discovery we never fail to get an imperfect knowledge of others of which we could have no idea before, so that we can not solve one doubt without creating new ones."

—Victor E. Levine, in *Scientific Monthly*, August, 1927.

LOUIS MEISBURGER, D.D.S., F.A.C.D.
(1867-1927)

Louis Meisburger, former president of the New York State Dental Society, the Buffalo Dental Association and the Eighth District Dental Society of New York, and a member of the Research Commission and the Dental Educational Council of America of the American Dental Association, died suddenly, August 10, shortly after leaving his home in Claremont Avenue, Buffalo, bound for his country home. He collapsed in his car and died shortly afterwards in the hospital, without regaining consciousness. He had apparently been in the best of health.

Dr. Meisburger was born at Lancaster, N. Y., May 14, 1867. He was educated in the Buffalo public schools and St. Joseph College. In 1888, he received the degree of doctor of dental surgery from the University of Pennsylvania. He had practiced his profession continuously since that time in Buffalo.

Dr. Meisburger was a member of the American College of Dentists and of Delta Sigma Delta Fraternity.

Surviving are his wife, who was Miss Theresa Francis Watt of Niagara-on-the-Lake, N. Y., and two sons, L. Halliday and William Meisburger.

DEPARTMENT OF DENTAL HEALTH EDUCATION

THE QUESTION OF FOODS*

By ETHEL AUSTIN MARTIN, B.S., M.S., Chicago, Illinois

I. INTRODUCTION

1. What is the relation of diet to the building of strong healthy bodies and sound teeth?

It has been a comparatively short time since "The Question of Foods" brought the dentist and nutritionist together to discuss the relationship between good nutrition and the formation of sound teeth. Each has been able to contribute much in solving the problem; but we all recognize the fact that there are many phases of the subject still in the controversial stage. The large bulk of recent reliable research done in this field, however, seems to point conclusively to the fact that the building of strong bodies and the building of sound teeth go hand in hand and that the condition of each during the growth period is affected by the state of nutrition of the child.

2. What is considered "the growth period?"

What do we mean by the expression "the growth period?" We commonly think of the growth period beginning when the child is born. Recent experimental feeding work has shown that the nourishment which a child receives has begun to affect his development several months before this. As a matter of fact, then, we must consider that the growth period starts at the beginning of pregnancy. During the latter months of pregnancy, when growth takes place very rapidly, and when the first teeth are being calcified, the need for careful feeding is particularly important. Our first consideration should be, then, to know what good nutrition *is* and what adjustments must be made to suit the needs of the various ages from the very beginning of growth in prenatal life to the end of the growth period, when adult life begins.

3. What is "complete diet for growth?"

The kind and amount of food which contributes to the nourishment of a growing child is a big factor in producing good nutrition. A complete diet for growth is one which in every particular provides for maintaining the body in good health and supports normal growth. Continually, we are learning new facts which cause us to adjust our ideas as to what may be con-

*Read before the Illinois State Dental Society, May 11, 1927.

*From the Department of Home Economics, University of Chicago.

sidered a "complete diet." Scientists are constantly working on the problem, and they are the ones who establish our dietary standards. Through observation of many children, they have been able to discover approximately how much food children of different ages should eat. This quantity is never a

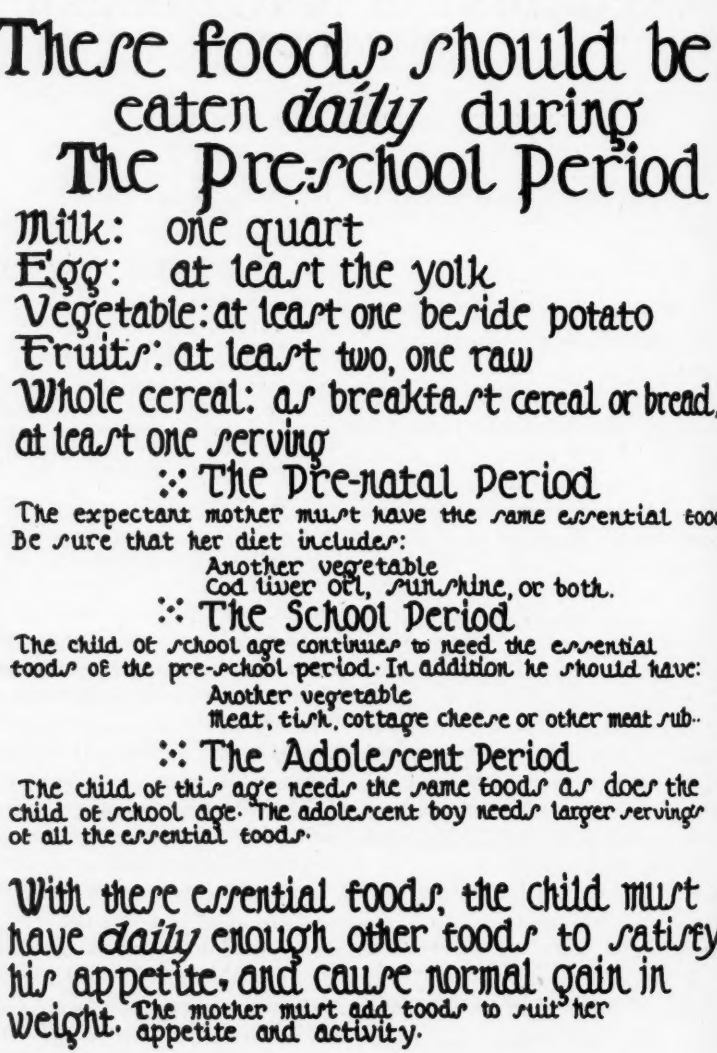
These foods should be eaten daily during The Pre-school Period
Milk: one quart
Egg: at least the yolk
Vegetable: at least one beside potato
Fruits: at least two, one raw
Whole cereal: as breakfast cereal or bread, at least one serving
The Pre-natal Period
The expectant mother must have the same essential food. Be sure that her diet includes:
Another vegetable
Cod liver oil, sunshine, or both.
The School Period
The child of school age continues to need the essential foods of the pre-school period. In addition he should have:
Another vegetable
Meat, fish, cottage cheese or other meat sub.
The Adolescent Period
The child of this age needs the same foods as does the child of school age. The adolescent boy needs larger servings of all the essential foods.
With these essential foods, the child must have daily enough other foods to satisfy his appetite, and cause normal gain in weight. The mother must add foods to suit her appetite and activity.

Figure 1.

stationary amount, and must depend on the rate of growth and the amount of individual. A young boy will often need as much or more food than his

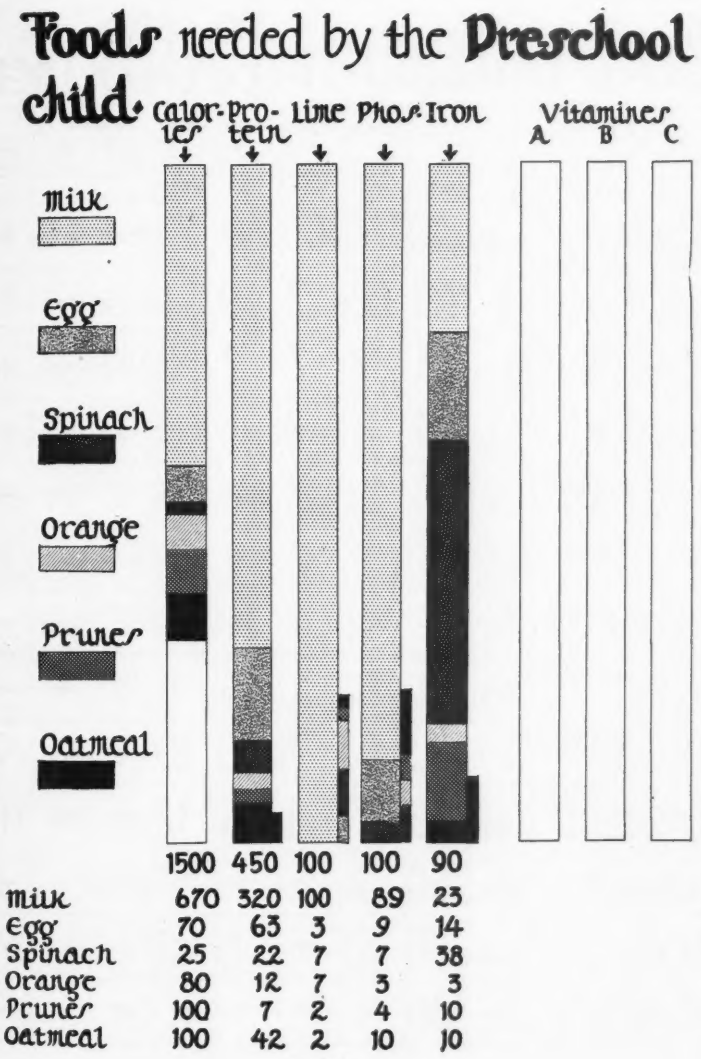

Figure 2.

activity of the child. I refer here to the total energy or calory need of the father because he grows fast and plays hard, while his father has ceased to grow

and usually exercises little. The question is often asked, "How can I tell when my child is eating enough food?" The answer is "Give him the right kind of food and, for the most part, let his appetite and his weight be the guide."

Food Values in the Pre-School Diet

Food	Amt.	Cal.	Protein	Lime	Phos.	Iron	Vitamines		
							A	B	C
Standards		1500	450	100	100	90			
Milk	1 qt.	670	320	100	89	23	+++	++	+
Egg	1	70	63	3	9	14	+++	++	?
Spinach	½ c.	25	22	7	7	38	+++	+++	+
Carrot	½ c.	25	6	3	3	3	+++	++	+
Orange	1 med	80	12	7	3	3	+	++	+++
Prunes	4-5	100	7	2	4	10	++	++	–
Oatmeal	⅔ c.	100	42	2	10	10	+	++	–
Bread (White)	3 sl.	150	52	2	5	5	?	+	–
Bread (Whole wheat)	3 sl.	150	60	3	10	10	+	++	?
Potatoes (Baked)	1 small	75	20	1	5	12	+	++	++?
Butter	1½ tbsp.	150	2	–	–	–	+++	–	–
Meat	1 sm. pc.	50	70	–	8	9	+	++	+?
Dessert	⅓ c.	100	–	–	–	–	–	–	–

Figure 3.

Few children receiving the proper kind of food will overeat. The growing

child should preferably be a few pounds overweight rather than underweight.

factory in other respects. Scientists have shown us rather conclusively that

A Suggested Day's Meals for A Pre-school Child

Food	Amount	Calories
Breakfast		
Orange	1 medium	75
Cereal	⅔ cup	100
+ Milk	⅓ cup	50
Toast	1 slice	50
+ Butter	1 tsp.	35
Milk	1 cup	160
Total		470
Dinner		
Meat patty (Ground beef	1 medium	50
Potato (Baked)	1 small	75
+ Butter	1 tsp.	35
Spinach	½ cup	25
+ Butter	1 tsp.	35
Cornstarch pudding	⅓ cup	100
+ Cream	2 tbsp.	40
Milk	1 cup	160
Total		520
Supper		
Poached egg	1	70
Bread	2 slices	100
+ Butter	2 tsp.	75
Prunes	4-5	100
Milk	1 cup	160
Total		505
	Grand total	1495

Figure 4.

A child may have enough calories daily and yet his diet may be unsatis-

building materials, such as protein for muscles and the minerals for bone, blood

and tissue, should appear in fairly definite amounts in the daily diet to assure normal growth and development in the child. There are many minerals which contribute to body growth but only three which are absent frequently from the diet of the average American family. These three are calcium (lime), phosphorus and iron. Especial care should be taken to include in a child's diet the foods which supply these three minerals.

The vitamins are the newest addition to the group considered essential to the adequate diet; and the number continues to increase. If any one of the vitamins is lacking in large enough amounts, a malady known as a deficiency disease results. The particular disease depends on the vitamin which is missing. If vitamins are absent in smaller amounts, the result is a lack of well being, less robust health and, in children, failure to grow. The vitamins best known at the present time are A, B, C and D.

Vitamin D has recently come into prominence and is of especial interest because of its effect on calcification of bones and teeth. The lack of vitamin D in the diet causes faulty bone calcification, known as rickets. Vitamin D is found in foods such as egg yolk, whole milk, butter and green vegetables, but in comparatively small amounts. It is abundant in cod-liver oil, and hence cod-liver oil is prescribed as a powerful preventive and cure of rickets.

This same curative property of cod-liver oil is found in the ultraviolet rays of the sun and of the mercury vapor quartz and the carbon arc lamps. A child, during the growth period, should have the benefit daily of vitamin D or its equivalent. Run-about children and those still older frequently play sufficiently long hours in the sun to require no other treatment. Whether or not young children should have other treatment than the sun's rays depends on the season of the year, the amount of time each day the child is exposed to the sun and the the type of clothing worn when in the sun.

II. THE PRESCHOOL PERIOD

1. What are the standards of good nutrition in the preschool period?

To make tangible what I am going to say of food needs for growth, I have selected the diet of the preschool child as the basis for my discussion. With the requirements for this period, I will compare the needs of the other periods of growth. Some one has said that if we eat what we should during the preschool age, we need not alter the character of our diet during other periods of growth. Let us see if this is true.

Within the rather wide limits set up by the rate of growth and activity, a child of the preschool age (3-4 years) should have a total of about 1,500 calories daily. Protein, which represents about 12 per cent of his total calories, approximates 42 gm. Study of many proteins has revealed the fact that certain kinds of proteins are better for growth than others. That is a point which must be considered in selecting protein foods for children.

Recent experiments with children have shown that lime and phosphorus should be taken in foods to the extent of 1 gm. of each daily. Preschool children should have iron for blood and probably 9 mg. daily will cover the need.

Vitamins, so far, cannot be measured as can the above-mentioned dietary constituents. Our chief concern is to eat generously of the foods which we know to be rich in the various vitamins.

2. What are the daily essentials at this age?

To center our attention on the diet of the preschool age, let us ask what the essential foods are for this period and how we know that they satisfy the needs. We are all more or less familiar with the group of foods which are frequently presented as the nucleus of the preschool child's diet. These daily "essentials" are: milk, a quart; vegetables, at least one, besides potato; fruits, at least two, one raw; eggs, at least the yolk, and whole cereal, as breakfast food or bread. (Fig. 1.)

What has been the origin of this group of foods and why have certain foods been selected as single items in this group? Certainly any one is justified in challenging the right of each food to appear on this list. Each food will speak for itself, in turn.

3. Are certain foods "essentials?"

Instead of using the terms calories, grams and milligrams, I have reduced all to a common basis and will refer to them as units. The eight bars on the chart (Fig. 2) represent the preschool child's total daily need of calories, protein, lime, phosphorus, iron and the vitamins A, B, and C. Whole numbers represent the standards in terms of units.

On this basis, I have prepared a chart which gives a definite value for each of the constituents of these foods. (Fig. 3.) Comparison of figures can be made by columns, not by rows. For instance, a certain number for calcium is comparable only with other figures for calcium. These amounts do not represent percentage composition of foods but stand for actual content in definite quantities of food which may be eaten by a child of preschool age.

Milk.—Let us see whether milk, to the amount of one quart, merits its place as first on the list of essentials. The only fair way to prove this is to see how many units of each essential it provides. One quart of milk furnishes 670 units of calories. One complete bar represents 1,500 units. That means that we can mark off 670 units on the bar and consider that much of our daily need satisfied. That means, too, that one quart of milk supplies almost one-half of the daily calory need of a preschool child. The next item is protein. The complete bar represents 450 units. Our chart shows that one quart of milk contributes 320 protein units. One quart of milk, then, provides about two-thirds of the protein need of the preschool child.

For lime (calcium) and phosphorus, the entire bar in each case represents 100 units, milk gives us 100+ units of calcium and 89 units of phosphorus; which shows that one quart of milk provides all of the daily need of lime and practically all of the phosphorus.

The bar for iron represents 90 units. One quart of milk furnishes 23 units—nearly one-third of the day's need. While milk is not generally considered an iron food, it does furnish a generous amount when taken in sufficient quantities. Iron in milk is in a form particularly good for a young child.

Vitamins A, B and C are the next consideration. Three crosses demonstrate that milk is very rich in vitamin A. The two crosses show that vitamin B is present in milk in good amounts. One cross shows that there is not a great deal of vitamin C present in milk. Fresh raw milk has a considerable

amount of vitamin C, but the majority of people take milk which has been heated more or less. Since milk is so valuable in other respects, and since it is advisable from the standpoint of disease to use heated milk, it is generally considered wise to depend on certain other foods to supply vitamin C.

One quart of milk, then, has proved its value in the diet on the basis of the amount and kind of its constituents. What happens when a child of this age does not take milk? He is deprived of an excellent kind of protein and iron; he is deprived of a food rich in vitamins A and B; he is deprived of a food which can supply all of his calcium and most of his phosphorus. It will be interesting to see whether a child can eat other foods which will supply sufficient calcium and phosphorus when milk is low or is taken out of the diet.

Egg.—Egg is the next food on the list of "essentials." One egg contributes 70 units of calories, 63 units of protein, 3 of calcium, 9 of phosphorus and 14 of iron. The white of the egg has contributed most of the protein, while the valuable addition of iron has been made by the yolk. The phosphorus contributed by egg has practically completed the total need for that mineral. From this point, we will note the amount of calcium and phosphorus in foods only as a matter of comparison with that supplied by milk (by indicating them on the opposite side of the bars). Egg yolk contributes generously to the supply of vitamin A. If a child received no other sources of vitamin A than 1 quart of milk and one egg yolk daily, he probably would be amply served. However, it has been found that vitamin A is stored in the body and an excess is not harmful.

Vegetables.—For the "one vegetable besides potato," let us select spinach as a representative of greens. One-half cup of spinach, an amount easily eaten by a child of preschool age, provides 25 units of calories, 22 units of protein and 7 units each of calcium and phosphorus. Obviously, spinach is not eaten to enrich the diet with the four above-mentioned elements. The chart shows why spinach has a place in a child's diet. It is interesting and enlightening to compare some of the other vegetables with spinach. Twenty-five units of carrots gives 6 units of protein and 3 each of calcium, phosphorus and iron. The contrast in iron is particularly striking. However, fresh young carrots make a valuable contribution with their vitamins and fill an important need in the diet.

Fruits.—The orange gives 80 units of calories, 12 units of protein, 7 units of calcium and 3 units each of phosphorus and iron. Taken in quantities such as are usually served, the orange makes a moderate contribution to protein and calcium and a poor contribution to phosphorus and iron. The foods observed above have been for the most part rich in vitamin A. Orange is rich in vitamin B and very rich in vitamin C. Thus, it can be seen that foods lacking or low in vitamin C may be supplemented with the C element in orange juice or other citrous fruits, such as grapefruit. Tomato juice is equally valuable. The presence of one of these daily in the diet assures an abundant supply of vitamin C. Raw fruits and vegetables are excellent sources of vitamin C, since the heating of the foods, usually served cooked, has been found to injure this vitamin, except in tomato.

Prunes may be added as the cooked fruit. A medium serving yields 100 units, because they are a more concentrated form of fuel than the fresh fruits. Protein, calcium and phosphorus are low, but iron is contributed fairly generously and in such amount as practically to complete the preschool child's daily requirement. Prunes are fairly rich also in vitamins A and B.

Whole Cereal.—I have selected oatmeal as the whole cereal, although a finely milled white cereal could be given and bread of the dark variety used. One serving of oatmeal gives 100 units. This provides 42 units of protein, 10 each of phosphorus and iron and a negligble amount of calcium. The whole cereal then stands out as a valuable source of phosphorus, iron and vitamin B. Any highly milled cereal in losing its outer coat and germ loses some of these constituents in the process.

The laxative properties of fruits, vegetables and whole grain cereals increase their value in the diet. The fruits act chiefly in this respect because of the stimulation to speedy digestion, while vegetables and whole cereals function mainly because of their bulk and indigestible residue.

We have now covered the group of foods termed "essentials." Are these foods "essentials" in the sense that they cover the needs of the preschool child? We may say that they are, for protein and minerals are complete. Vitamins A, B and C are provided for, and only calories must be supplemented.

Are they "essentials" in the sense that substitutes cannot replace them? When a mother tells you that her child refuses milk, can you truthfully tell her that a varied diet containing fruits and vegetables will be just as good and that she need not worry?

The chart shows that the answer will be "no," for by grouping all of the "essentials," not even one-half of the lime and phosphorus standard can be reached. On this basis alone, there is no substitute for milk. A brief discussion of some of the other foods which commonly make up a child's diet shows, by comparison, that the other "essentials" have an equal right to their place on the list.

4. How shall the daily diet be formed?

Since we must think of these essentials in the terms of a day's food for a child of preschool age, let us see how the "essentials" group themselves into a diet. (Fig. 4.) We can put the orange, cereal and milk into the breakfast; the spinach and milk into the dinner; and the egg, prunes and milk into the supper. What are the other foods which may be added to these "essentials," which will make the meals "filling" and palatable? Bread is probably the first among foods which are naturally included in a meal. I have put two slices in the supper and one, as toast, in the breakfast. What does bread contribute? Does it make any difference whether white or dark bread is used? (Fig. 3.) In 150 units of bread (three slices), the whole grain bread has the advantage in every case, the units becoming doubled in the case of phosphorus and iron. In this diet, dark bread is not needed for the iron, but in case the whole grain breakfast food or the prunes were omitted, the dark bread would be needed to supply iron.

Potatoes are a good fuel food and contribute liberally of iron when the mineral matter which lies under the skin is not discarded. Because they are comparatively poor in minerals and vitamins, for the calory units provided,

they cannot be substituted for other vegetables.

Butter is added not only because it makes many foods more palatable but because it adds calory units; and because of the vitamin A. Its other contributions are negligible. Butter for toast, bread, potato and spinach totals about one and one-half tablespoons or 150 units.

Meat or a substitute, in a small amount, may be added to the dinner to provide calories and to lend variety and interest to the meal. Even a small amount of meat yields considerable iron and protein. These could have been left out of the present diet and calories provided in another way. A meat substitute might be placed here instead of meat. The vitamin content of meat varies with the part of the animal from which it comes. Glandular tissue of meat is known to be richer in vitamin than the muscle meat.

Our day's meals are complete now with the exception of a simple dessert. In addition to the three glasses at mealtime, we have used a little milk on the cereal and some top milk for the dessert. We may use a part of the remainder in preparing a simple pudding. The milk has already been counted in the quart. The addition of cornstarch, sugar and a little chocolate will add little else than units of calories.

Summary: Counting up, then, we have completed the meals for a preschool child. What have we added to the "essentials?" For the most part, we have added largely calory foods, for that is what was needed. In some cases, foods valuable in other respects than calories have been added. Information concerning these may be used in the formulating of other diets.

III. NUTRITION REQUIREMENTS OF THE PRESCHOOL PERIOD COMPARED WITH THOSE OF OTHER PERIODS

1. *Prenatal Period.*—How do the needs of the preschool period differ from those of other growth periods? We have said that the growth period of a child begins before birth, during prenatal life. From the time when life begins, the expectant mother must nourish the fetus. Obviously, the food that she eats not only benefits the unborn child, but also protects her own body from being sacrificed in the building of the child.

Are there certain foods which a pregnant woman should eat? The greatest care must be exercised in selecting foods which satisfy the growth needs of pregnancy. Let us compare her requirements with those for the growth of the preschool child. A study of her needs has shown that she requires the same essential foods as the preschool child. In addition, she must be sure to have another vegetable. Also, cod-liver oil or sunshine, or both, must be included in her daily program. The building foods and growth-promoting foods must come first in her diet as they do in the preschool child's diet.

While an adult can satisfy the need for lime with the use of one pint of milk, during pregnancy the mother must protect her own bones and teeth and build those of her child by taking the abundant calcium furnished by one quart of milk. The egg, fruit and whole cereal remain the same. The second vegetable is added to increase bulk, minerals and vitamins in the diet. The cod-liver oil was not placed on the list of "essentials" for the preschool child. It is placed here to aid in the calcification of bones and teeth of the

fetus and to protect against the onset of rickets before the birth of the child.

Parks says:

> Personally, I believe that if pregnant women received ample well-balanced diets, in which green vegetables were abundantly supplied, and cow's milk was regularly taken, and were kept a sufficient part of their time in the open air and sun, and if their infants were placed in the direct rays of the sun for a part of each day and were fed cod-liver oil for the first two or three years of life, more could be accomplished in regard to the eradication of caries of teeth than in all other ways put together, and that rickets would be abolished from the earth.[1]

Obviously, cod-liver oil may not come amiss in the diet of the preschool child. However, a child of this age has passed the period when he is most susceptible to rickets. Also he is now out doors a great deal, and should be exposed to the ultraviolet rays of the sun. If this is true, his diet may be adequate without the cod-liver oil. In the winter, when the hours of sunshine are much fewer and a preschool child is out doors little, he may require cod-liver oil or treatments from a lamp artificially producing ultraviolet rays to induce proper calcification of bones and prevent or cure rickets.

The greatest difference between the preschool and prenatal diet comes in the increased amount of the "filler." A woman during pregnancy should eat the essentials first and then add other foods in accordance with her appetite and activity. Obviously, there will be considerably more of these "other foods" in the prenatal diet than in the preschool diet. The physician will watch her weight and will suggest adding to or cutting the amount of food. She may, for the most part, satisfy the craving for certain foods if she has eaten the prescribed "essentials."

2. *Infancy.*—A child born strong and well, because of improper feeding may become malnourished during the first months of life. There are certain foods which must be added early in order to meet the needs of the rapidly growing body. Breast feeding by a mother whose diet is adequate is the first requirement of a proper diet. The addition of cod-liver oil and orange juice during the first month of life helps to insure proper calcification of bones and teeth and to provide vitamin C. By the fifth month, one cereal feeding should be added in place of one milk feeding. A vegetable feeding should be added soon after this, and so on, until, on his first birthday, a child should be entirely weaned and should be taking approximately one quart of cow's milk daily. His other daily "essentials" are practically the same as those of the preschool child, but given in a very simple, easily digestible form.

3. *The School Period (10-12 Years).*—During the years from 10 to 12, the same "essentials" should be maintained in the diet as in the preschool age, with the exception of a greater amount of "filler," to insure normal gain in weight, an added vegetable and the more regular use of meat or a meat substitute such as fish or cottage cheese.

4. *Adolescent Period.*—The "essentials" of the adolescent period do not vary from those of the school period except in the larger servings of vegetables, fruit and cereal. Obviously, the great activity, especially of boys, during the adolescent period necessitates the addition of many foods, which will

1. Parks, A. E.: Certain Factors Causing the Deposition of Lime Salts in Bones, Dent. Cosmos, 65: 176 (Feb.) 1923.

increase the calories enormously. Children of this age almost never overeat, and there is a danger of underfeeding because parents seldom realize the great need of much food to cover the demands for growth and activity. Food at this period should be fairly concentrated to make it unnecessary to eat such huge quantities of food. After the "essentials" have formed the nucleus of the diet, a variety of substantial foods should complete the daily menu.

IV. NEED FOR A DIET PLUS GOOD HEALTH HABITS

But this is not the entire story. Good nutrition cannot be supported alone by good food. Unless a child has plenty of sleep, regular elimination, fresh air and exercise, he will not be hungry for his food, and any number of carefully planned meals will not induce the good nutrition sought.

Also, these desirable essential foods must, for every age, be grouped into satisfying meals which remain constant in quantity from day to day and these meals must be appetizing and served at regular hours. Food eaten between meals, especially when it is of the sweet variety, tends to destroy the appetite for simple nourishing foods served at meal hours. Any between-meal food should be given with the greatest of discrimination, bearing in mind the effect it has on driving the "essentials" out of the diet.

V. SUMMARY

Can we not say that the foods we have listed as "essentials" are essential in the true sense of the word? They are not foods picked at random, nor have the amounts been chosen as a matter of convenience.

We may say, then, of these foods that:

1. They practically satisfy the established dietary standards, calories excepted, from prenatal life through all of the growth periods to adult life.
2. They permit of substitutions only within the limits mentioned.

METHODS EMPLOYED IN THE CITY SCHOOLS OF ALLENTOWN, PA., TO INDUCE CHILDREN TO TAKE BETTER CARE OF THEIR TEETH

By FRANK S. BOYER,* M.D., Allentown, Pennsylvania

Health, after all, should be the supreme interest of everyone. Riches, fame, in fact, everything considered to be valuable, is not worth a great deal unless accompanied by abounding good health. When the average citizen realizes this fact, another great stride in preventive medicine will have been taken. If you are not robust or as well as you might be, sincerely make an effort to get in that condition at once. Obtain the doctor's and dentist's advice, and heed it.

DENTAL hygiene was instituted in Allentown in 1922. In 1923, Pennsylvania had twelve dental hygienists in all its schools, four of whom were employed in Allentown. The state now has 140 dental hygienists in its various schools.

*Chief medical inspector, Allentown Public Schools.

During the past seventeen years, as one of the medical inspectors of the schools of Allentown, I have seen hundreds of children whose teeth were either totally or at least in a degree neglected. Some of this neglect is due to fear of the children regarding dental treatment; some, to lack of pride, in a number of the older children, in looking as well as possible (for no one really looks his or her best if the teeth are not properly cared for); some to sheer indifference and ignorance on the part of parents and children, and some to financial embarrassment of the parents.

When we realize that decayed teeth, especially, and dirty teeth, lead to rheumatism, and rheumatism leads to heart and kidney affections, and that when once the heart and kidneys do not function properly, all the remainder of the body suffers, we cannot but commend most heartily the act of the Pennsylvania State Legislature in requiring that any child who is obliged to go to work before 16 years of age must pass a physical examination, and that no child who has more than two decayed teeth shall be granted a working certificate until the teeth are properly taken care of. In following out this part of the Child Labor Law to the letter, we have been instrumental in having the teeth of from seventy-five to 125 children cared for each year. We often see children with five, six, eight, ten, twelve (and in one case there were twenty-one) decayed teeth, who would simply go uncared for

Fig. 1.—School clinic.

if it were not for this provision of the Child Labor Law.

During the term of 1926-1927, we have made a special and concerted effort to get our school children to do more tooth brushing, and to take better care of their teeth. We have followed out a plan of daily investigation, either by the teacher, the nurse or the medical inspector, as to what the boys and girls, especially in the upper grades, did in regard to brushing their teeth the day before. Then we have tried to get the children to pledge themselves to brush the teeth at least once daily, that brushing, if only once a day, to be before going to bed at night; to have the teeth cleaned at least once a year by a dentist, and to have the teeth examined at least once a year by a dentist, at which time any teeth needing filling are to be filled.

In following out this plan, we started in a building in what we call one of the better sections of the city. We found that nearly all of the pupils had toothbrushes, but when we asked how many brushed the teeth every day, the affirmative answers numbered from eight to fifteen in a room of from thirty to thirty-five children. When asked whether they were all willing to brush their teeth at least once a day, usually all hands but one or two went up. The children who were unwilling to comply were made to see the error

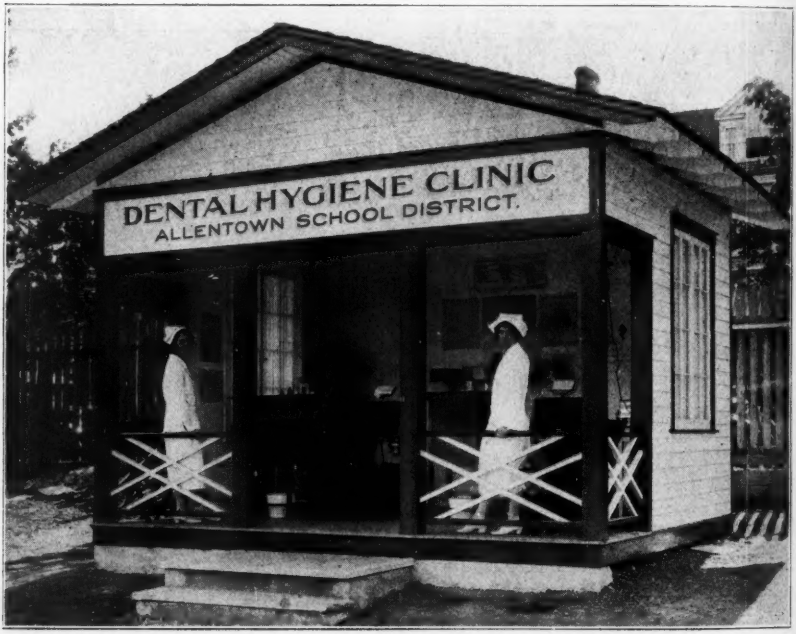

Fig. 2.—Dental hygiene clinic.

of their way by showing them that, where all the others in the class room were willing to do such a proper and necessary thing, they surely should do the same. They were allowed to explain why they were unwilling to brush the teeth, and were given advice to help them overcome their difficulties. It, of course, often becomes necessary to go into the simplest, and one must say, seemingly the most insignificant, detail in such a plan, but if persisted in, it brings results.

The teachers were then requested to keep a record chart in their rooms, open for inspection by everyone, and, on this chart, to record daily how many children had brushed the teeth the day before. If every one present had brushed the teeth the previous day, the room was considered a 100 per cent room for that day. Later on, the duty of keeping the chart record is assigned to one of the pupils of the room. The record of this room was then taken as an incentive to competition in other class rooms, in the same building, to see how many rooms in the building could attain 100 per cent every day, or how many days in a month these rooms could have a 100 per cent record. Finally, after a goodly number of the class rooms were making a record of 100 per cent daily, the information was spread to other buildings, and the spirit of rivalry and competition was aroused.

During the regular yearly examination of the sixth, seventh and eighth grades, we have laid particular stress on brushing the teeth daily and at least one dental cleaning and examination a year, at which time any teeth needing treatment are to receive treatment. By permission of our superintendent of schools, we had the children of these grades copy in their notebooks, or on blank pages in their physiologies, the three following instructions under the heading "Three Thing to Do to Keep Your Teeth as Long as You Live: 1. Brush your teeth every evening before going to bed. 2. Have your teeth cleaned by a dentist at least once a year. 3. Have your teeth examined by a dentist at least once a year, and if any need filling, have them filled." The children memorized these three instructions, and they were told that one of the first things they would be asked to do when applying for a working certificate would be to repeat these three sentences. It is gratifying to see how much cleaner the teeth of those who apply for working certificates, as well as of all the other children, are, since we have undertaken this program. By permission of our superintendent of schools, we have had the three instructions printed on cards, 2½ by 4 inches, and every pupil applying for a working certificate is handed one of these cards and is asked to memorize the instructions, and not only memorize them, but also carry them out. Before this program was put into effect, we were obliged to reject about 40 per cent of our applicants for working certificates because of neglected teeth; today, we are obliged to reject only about 10 per cent. No child that

TABLE 1.—SUMMARY OF DENTAL TREATMENT

Number of applications for treatment	425
Number of cases treated	89
Applications on hand	336
Extractions of deciduous teeth	104
Extractions of permanent teeth	14
Fillings, permanent	243
Fillings, temporary	138
Treatments	197
Cleaning	51

had to be rejected until his teeth were treated and filled ever said he was sorry that his teeth were attended to; on the contrary, all are pleased, and many of the children, and even some of the parents, have admitted that this is the only means of inducing them to have dental children as possible. Our dental surgeons are now equipped with a portable outfit, and many more children have been given treatment than heretofore.

I have always felt that the dental work in the schools should be extended at least to include the sixth grade. I

TABLE 2.—DEFECTS

	Treated		Not Treated		
	Cured	Improved	No Treatment	Left School	Total
Eye disease (glasses needed)	261	39	247	17	564
Ear disease	190	17	9		216
	Operations				
Enlarged tonsils	49	95	313	10	467
Adenoids	2		5		7
Nasal catarrh	19	1			20
Decayed and dirty teeth	412	511	1008	109	2040
Tuberculosis		34			34
Enlarged glands		34	10	2	46
Nervous disease		4		1	5
Malnutrition		12			12
Skin disease	12	19	10	5	46
Pediculosis	85	12			97
Deformities			18		18
Heart Disease			9		9
Speech defect			10		10
Miscellaneous	2	3	6		11

Quarantinable diseases:
Cases found in school and excluded:

	Cured	Total
Diphtheria	2	2
Tonsillitis	10	10
Chickenpox	9	9
Mumps	1	1
Whooping cough	1	1

care, and that henceforth they were determined to have their teeth cared for.

In our schools, the board of school directors employs two dental surgeons, one dental nurse and four dental hygienists. Up to this time, pupils of only the first, second and third grades receive treatment. The hygienists go over the teeth of the children in these grades twice a year, making a determined effort to get as many parents to consent to dental treatment of their

believe that if this is done, if these older children have their teeth preserved to this age, they will then see the importance of taking care of their teeth, and from that time on, they will put forth a greater effort to preserve their teeth for future years.

Following are statements by the school superintendent and by a teacher regarding the value of mouth hygiene in the public schools.

A SUPERINTENDENT'S VIEW OF MOUTH HYGIENE IN THE PUBLIC SCHOOLS

In 1923, a special committee of the Board of Education of the City of Allentown, Pa., considering a recommendation of the superintendent of schools that Mouth Hygiene be established as a part of the school health program, made a special report, in part as follows:

"Before the Fourth International Congress on School Hygiene, meeting in Buffalo, Aug. 26, 1913, Alfred C. Fones made the following statement in a paper based on the results of examinations of school children: The average boy of ten years has teeth covered with green stain, and badly decayed temporary and permanent teeth. Possibly fistulas on the gums show outlets for pus from the decaying roots, and decomposing food around and between the teeth. Here, at the gateway of the system is a source of infection sufficient to contaminate every mouthful of food taken into the body. With decomposition instead of digestion taking place in the alimentary tract, it is no wonder that the child suffers from autointoxication, which produces eye strain, anemia, malaise, constipation, headache, fevers and many other ailments."

Again:

"It was determined that four things were necessary to bring about good teeth conditions: (1) a systematic cleaning of teeth by trained persons; (2) the establishment of the habit of the toothbrush; (3) a system of dentistry that would not be a charity, and (4) health talks on proper food, and mouth cleanliness.

"To summarize, briefly, your committee found that:

"Unclean mouths, and decaying teeth are a menace to health, and that, under ordinary conditions, about 10 per cent of school children use toothbrushes.

"Malocclusion, which means that teeth are out of their normal position in the mouth, is as common as dental caries (decay).

"Retardation of pupils in school is influenced by the toxic effect produced by numerous bacteria in unclean mouths and diseased and pulpless teeth.

"By an expenditure of $41,000 next year for the hiring of twenty-three dental hygienists, two supervisors and three dentists to carry on the mouth hygiene work for 22,000 pupils of the fifth grade, Bridgeport will be saving approximately $100,000 in hiring fewer teachers, having better health conditions, better attendance and less retardation in her schools."

On the adoption of this report by the board of education, two dental hygienists were engaged for the purpose of cleaning the teeth, locating caries and giving health talks to the 1,600 children of the first grade. Later, four hygienists were engaged to so treat the teeth and mouths of all children of the first three grades, approximately 4,700 children.

It is now proposed to extend this work so that over the period of the next three years, all children of grades 1 to 6 will have treatment from the dental hygienists. It will then be proposed that one of the conditions for promotion from the elementary school to the junior high school will be clean, sound teeth, lacking caries.

After five years' experience in mouth hygiene work in our schools, it has been determined that clean mouths and sound teeth have a most wholesome effect on the health and habits of the pupils.

To accompany the oral hygiene work, our schools have both a stationary dental clinic and a movable dental clinic outfit. The first permanent molars of all children in the city needing attention are treated free of cost, and any serious mouth conditions are also immediately treated.

A splendid spirit of cooperation has grown up between the public school and the parents, because of this work; and no finer spirit of cooperation exists anywhere than that between the schools and the dentists of the city.

One of the splendid influences of mouth hygiene work in our schools, after four years of operation, was its contribution to cutting down retardation, as shown in Table 3.

TABLE 3.—PERCENTAGE OF RETARDED PUPILS

Grade	1921	1925
1	12.0	7.0
2	20.5	9.0
3	27.2	18.4
4	29.7	20.2
5	33.3	25.0
6	34.5	28.8

While other factors contributed toward this result, undoubtedly mouth hygiene played a most prominent part.

We find the toothbrush habit well established.

The family dentist has become a habit.

Pupils are cleaner and more neatly dressed.

All health work in the schools has received an impetus.

Attendance has improved markedly.

H. W. DODD,
Superintendent.

DENTAL HYGIENE WORK IN THE PUBLIC SCHOOLS FROM A TEACHER'S POINT OF VIEW

Looking ahead, as sincere interest in the child compels us to do, and imagining some of the experiences of life he is sure to meet, it is certain that health will, in a large measure, decide his development and the measure of his success.

As many of the ills of life are the result of unclean mouths and neglected teeth, we surely cannot overestimate the value of dental hygiene work in the public schools.

The work of the dental hygienists in our public schools is of prime importance. Anyone coming in daily contact with the children who have been under her care can note the excellent results of her untiring efforts for clean mouths and intelligent care of the teeth. No one contributes more toward the general health of the school child than the dental hygienist, as she takes the little 6-year-old child and implants in him a keener desire for cleanliness and neatness. After her first efforts, there is little or no fear of the dentist or doctor. The ills so common to early childhood are easily detected, and most of them are corrected before the end of the first school year. Her influence, and constant attention through the primary grades, with the nurse's, dentist's and doctor's watchful care, is sure to give the child that definite bent, so that he will continually, by his own efforts, do much toward securing and preserving the health, indispensable for the fullest use of the opportunities of the coming years.

This desire for cleanliness, neatness and good health constantly pervades the atmosphere of the class room. Not only do the children take an unusual delight in hygiene work, but everything with which they come in contact must be clean. The result is: neat work, clean desks and floor. It is easy to obtain order, system and the quietude so much appreciated during the school's busiest hours. The feeling of cleanliness, and neatness, gives to all that increased self-respect which makes teaching a joy. There is that ready response and desire to learn, that steady, yet often remarkably rapid, progress, sure to come from healthy, strong, vigorous children, unhampered by physical defects.

Dental hygiene work in our public schools is indeed indispensable, when the wealth and power of the nation's future depends almost wholly on the health of its school children.

MABELLE MEASE

A REPORT FROM A SCHOOL NURSE*

The following is a part of the annual report of the hygiene department of the Belleville, Ill., public schools for the past school year, to the superintendent of the Belleville schools.

DENTAL DEPARTMENT

Dental Dispensary:

During the school year the clinic was in operation three afternoons of each week:

No. of schools from which patients were received	10
Total number of afternoons clinic was in operation	98
New patients received	135
Visits from patients, new and old	672
Treatments administered	163
Prophylaxis performed	72
Oxyphosphate of copper cement fillings	27
Amalgam fillings	230
Silicate fillings	9
Root canal fillings	16
Cement fillings	71
Deciduous teeth extracted	202
Permanent teeth extracted	37

On the whole, we have had wonderful cooperation from principals and teachers with regard to appointments.

There are about thirty-five patients, including some new applicants, that are being held over until next fall, some were given preventive care and are to return in the fall for further treatment.

*All reports are somewhat alike in form. It is because this report was made by a school nurse who sees the value of and has enthusiasm for a dental health program for school children, that this report is published.

EDUCATIONAL

Our teachers and pupils have taken an active interest in oral hygiene. Most of the rooms have had inspection for cleanliness each morning including "clean teeth."

The parent-teacher association of two schools purchased a number of toothbrushes, which were given to pupils who could not afford to buy brushes.

Posters:

Our posters on oral hygiene that were displayed during the Seventh International Dental Congress at Philadelphia were exhibited at the Elks' Club during the Illinois State Board meeting that was held in October.

During Health Promotion week in April, we had a display of health posters in five of the shop windows, among which were some very good posters on oral hygiene.

Lectures:

Four members of the Belleville Dental Society gave talks on oral hygiene at meetings of each parent-teacher association of our schools.

A dental film "A Fair Day," a lesson in oral hygiene, was shown to all junior high school students, January 12, through the courtesy of the state department of health. A member of the Belleville Dental Society gave an interesting talk after the picture, and literature was distributed on "Care of the Teeth."

A number of leaflets issued by the Chicago Dental Society in connection with the mouth hygiene campaign being carried on by the Illinois State Dental Society were distributed and read to the lower grade pupils by the teachers.

A toothbrush drill was given in each room throughout our schools, demonstrating the proper use of the toothbrush, and followed by a short talk on "The Importance of Clean Teeth."

We have made great progress over last year in our educational movement in oral hygiene. A great amount of this credit is due the Belleville Dental Society. One of their members was chosen chairman of the educational department, and he, with other members, has given time to developing the educational program as well as time in the clinic.

We owe a debt of gratitude to twelve members of the Belleville Dental Society for the time and interest that has been given by them gratis to the school dental clinic this past year.

Dental Inspection:

Inspection was made in all the schools during the month of November, 1925. A summary of the findings in the examination follows:

Number of schools in which examinations were conducted	10
Total number of pupils examined	2,626
Defects found	2,090
Pupils with good teeth needing no present dental attention	462

A report of the findings of each examination was sent home with the child to the parent, and a duplicate copy is filed in the clinic.

Number of children who responded to the examination by going to their family dentist	405

Dental Dispensary:

During the year, from September 22 until March 1, the clinic was in operation Tuesday and Friday afternoons of each week. From March 1 until June 18, we held a clinic three afternoons of each week.

No. of schools from which patients were received	10
Total number of afternoons clinic was in operation	86
New patients received	135
Visits from patients, new and old	617
Treatments administered	162
Prophylaxis performed	56
Oxyphosphate of copper cement fillings	32
Amalgam fillings	214
Silicate fillings	16
Root canal fillings	25
Cement fillings	36
Deciduous teeth extracted	156
Permanent teeth extracted	41

Medical and Dental News

Arkansas

Chairman of Dental Examiners: W. E. Hutchinson of Dermott was recently made chairman of the Arkansas State Board of Dental Examiners. Newly appointed members of the board are A. E. Chambers, Texarkana, and C. L. Hunt, Fort Smith.

California

Committee Requests Consultation on Pyorrhea Research: For two years, about fifty members of the faculty of the University of California and assistants have been investigating the cause of pyorrhea. The Carnegie Corporation and various dental societies furnished about $100,000 to carry on the work. Some of the experiments seem to show that in animals and man a condition approximating pyorrhea can be induced by "slight upsets in the acid-base balance of their diets." On account of this seeing "tan-gential direction" which the research took, the stomatologic research committee of the university requested the Carnegie Corporation to send the following men to California for consultation on this problem: Lafayette P. Mendel, Ph.D., Sterling professor of physiologic chemistry, Yale University; E. V. McCollum, Ph.D., professor of biochemistry, Johns Hopkins University School of Hygiene and Public Health, and Dr. Edward H. Hatton, professor of pathology and special research investigator, Northwestern University Medical School, Chicago. Dr. Mendel first made the trip, and Dr. McCollum went late in July. Dr. Hatton arrived at about the same time. Heretofore, research into the cause of pyorrhea has been largely through the approach of bacteriology rather than of nutrition.—*J.A.M.A.*, Aug. 6, 1927.

Zoological Hospital Offers Facilities to Physicians: About 135 physicians and other scientists attended the recent dedication, sponsored by the Zoological Society of San Diego, of the Zoological Hospital and Research Institute, San Diego, which is a gift of Miss Ellen C. Scripps. Physicians interested in research are invited to avail themselves of its facilities, no charge being made except for material used or broken. The building is located in a large zoological garden. It will be a hospital for animals in the zoo and pathologic tissues from zoos throughout the country will be collected for a study of animal diseases. Physicians, research workers and students in biology will find here the necessary equipment for carrying on research. There are eleven small laboratories, each equipped for special work, a roentgen-ray and dark room, a library, general laboratory, technician's laboratory, offices and morgue and a photomicrographic outfit. The plan is to afford college professors and advanced students an opportunity to continue studies when in California, and to attract biologists interested in avian and mammalian research, as do some noted marine biologic stations. Further information will be given on request to the hospital, Balboa Park, San Diego. Dr. Rawson J. Packard is chairman of the hospital and research committee, and H. C. Goodsil, director of research and education.—*J.A.M.A.*, July 30, 1927.

Indiana

Named as Dental Examiner: Carl W. Sibbitt, of Frankfort, has been appointed to serve as a member of the Indiana State Board of Dental Examiners. Other members of the examining board are C. J. Burris, Washington; J. M. Hale, Mt. Vernon; R. R. Gillis, Hammond, and W. T. Linn, Crawfordsville.

Minnesota

District Society Elects Officers: Recently elected officers of the Northwestern Dental

Society, a component of the Minnesota State Dental Society, are: president, H. W. Remele, Crookston; vice president, Leo Moos, Moorhead; secretary-treasurer, A. C. Gottenborg, Detroit.

New Jersey

List of State Licensees: The State Board of Registration and Examination in Dentistry of New Jersey has issued a report and list of licensees, with addresses, for 1927. The list is corrected to June 1. It is arranged alphabetically and names of dentists not registered, not practicing or in military service are starred, etc. A list of licensees for whom the addresses are desired is given, and a "prosecution report" regarding those convicted of illegal practice is appended.

New York

Newly Elected State Society Officers: The following are the recently elected officers of the Dental Society of the State of New York: president, Thomas R. Cullen, Oswego; president elect, Gerald G. Burns, Rochester; vice president, William C. Fisher, Bronxville; secretary, A. P. Burkhart, Auburn; treasurer, George H. Butler.

Work of Medical Woman's Auxiliary: Organizations have been formed in most of the states, at the suggestion of the state medical societies, and under the title "The Women's Auxiliary of the American Medical Association," having as their principal object the interpretation of the aims of the medical profession to outside groups, such as women's organizations. The members make an effort to inform and educate themselves regarding public health work, and when health programs are sponsored by lay groups, use their influence to see that the material used and the speakers are endorsed by scientific medicine.

Ohio

New President of Dental Board: Joseph T. Williamson of East Liverpool was recently appointed as president of the Ohio State Board of Dental Examiners to succeed the late Dr. Albert O. Ross, of Columbus.

Oregon

State Society Elects Officers: The following are the newly elected officers of the Oregon State Dental Society: president, Arthur F. Weeks, Portland; vice president, B. R. Elliott, Medford; treasurer, R. T. Meaney, Portland.

Wyoming

State Society Elects Officers: The following are the recently elected officers of the Wyoming Dental Association: president, C. E. Duncan, Casper; vice president, G. A. Defreece, Edgerton; treasurer, Peter Appel, Jr., Cheyenne; secretary, E. C. Andrews, Cheyenne.

Foreign

New Chair of Research: A new chair of dental research has been established in the University of Toronto. Harold Keith Box, professor of periodontology, will head the new department.

New Indian Dental Journal: The Indian Dental Review, "a journal of practical dentistry devoted to the advancement of dental science in India," makes its initial appearance with the June issue. The editor is M. K. Patel, D.D.S. (University of Pennsylvania), Dr. med. dent. (Germany), and the periodical will be published quarterly, at Karachi, India.

General

Medical Association Discourages Physicians' Home Project: The American Medical Association, in a recent editorial, deprecates the proposed campaign to gather funds for the establishment of a national home for indigent and incapacitated physicians. After a survey conducted by communication with the secretaries of county medical societies, it has been concluded that the need for such an institution is small, as most of the few physicians who come to want are quietly provided for in their own communities. Aside from the economic aspect of the problem, the advisability of taking the physician away from his accustomed environment and old friends is seriously questioned.

Dean Chandler's Scrapbook: A very important discovery in the form of the scrapbook kept by Dr. Thomas H. Chandler, who was dean of the dental school (Harvard) from 1874 up to the time of his death in 1895, has been loaned to the editors of the "History of the Harvard Dental School" by Dr. Frederick Hopkins, '89, who was associated with Dr. Chandler. The scrapbook contains a great many original letters written by Dean Nathan C. Keep, first dean of the dental school; the late president Charles W. Eliot of Harvard; by Samuel S. White, founder of the S. S. White Company; and by other deans of the school and prominent

instructors, as well as program cards, matriculation cards and schedules of the courses former prominent instructors taught. After Dr. Chandler's death, the scrapbook came into the possession of Dr. Hopkins, who has kept it for more than thirty years. The scrapbook is now in the hands of the editors of the dental school history, who state that it contains much valuable information concerning the early history of the school. Eventually the scrapbook will be turned over to the dental museum.—*Harvard Dental Record*, July, 1927.

DEATHS

Abbott, Frank P., Mineola, N. Y.; Tufts College Dental School, 1877; died, August 4; aged 75. Dr. Abbott practiced in Brooklyn for many years, moving to Mineola last spring on his retirement from practice.

Baird, H. M., St. Louis, Mo.; State University of Iowa, College of Dentistry, 1886; died recently, aged 69. Dr. Baird retired from practice two years ago.

Bowen, Bowen K., Nashville, Tenn.; Vanderbilt University, School of Dentistry, 1901; died, August 4, as a result of roentgen-ray burns contracted one year ago, in constant work with roentgen-ray films. Six months before his death, a finger was amputated in an effort to check the condition. Dr. Bowen had practiced in Nashville for eighteen years.

Bredouw, L. H., Kansas City, Mo.; Kansas City Dental College, 1892; died recently.

Ferguson, Alexander, Westerly, R. I.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1904; died, August 1, after a long illness; aged 47.

Ferguson, W. S., Lubbock, Texas; died, June 28; aged 65.

Fisher, T. D., Monroe, La.; Western Dental College, 1901; died, August 1, aged 49. Dr. Fisher moved from Pontiac, Ill., to Monroe a year ago.

Frankfelt, Robert, Brooklyn, N. Y.; died July 28, from accidental asphyxiation by gas from a water heater. Dr. Frankfelt was a recent graduate.

Fuller, W. C., Lufkin, Texas; died, August 4.

Gaston, Shephard Mills, Keokuk, Iowa; died, July 29; aged 79. Dr. Gaston was a veteran of the Civil War. He retired from practice two years ago.

Gilbert, James M., Dallas, Texas; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1899; died, August 13, aged 55.

Gillhooley, Austin A., East Lansing, Mich., University of Michigan, College of Dentistry, 1923; died suddenly, July 13, while at work in his office; aged 30.

Grant, Edward G., Cincinnati, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1891; died, June 23; aged 59.

Isserlis, Samuel, Fall River, Mass.; Tufts College Dental School, 1925; died suddenly, June 23; aged 26.

Kelly, Jennie L., Chicago, Ill.; American College of Dental Surgery, 1892; died, June 13.

Mason, Finley Hildane, Spokane, Wash.; American College of Dental Surgery, 1893; died, August 3, after an eight weeks' illness with sleeping sickness.

Montgomery, Gaston, Gulfport, Miss.; Vanderbilt University, School of Dentistry, 1899; died, July 9; aged 50.

Moore, Edward Lewis, Sedalia, Mo.; Pennsylvania College of Dental Surgery, 1892; died recently, from a heart attack, following an automobile accident. Dr. Moore was 68 years of age.

Nearing, George Edward, Syracuse, N. Y.; New York College of Dentistry, 1887; died, July 7, from a heart attack, suffered while driving his car. Dr. Nearing had been in poor health for some time, but had continued in practice. He was in his seventieth year and had practiced his profession for nearly half a century.

Newhouse, George Henry, Rochester, Minn.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1905; died, July 17; aged 48.

Perrin, Thomas L., Brooklyn, N. Y.; died, June 29; aged 83. Dr. Perrin was a veteran of the Civil War, which he entered at the age of 17. He was honorably discharged as sergeant in 1865, bearing a wound that left him lame throughout his life.

Putney, C. A., Fargo, N. D.; University of Minnesota College of Dentistry, 1905; died August 1; aged 51.

Smith, C. E. C., Newark, N. J.; died suddenly, August 1; aged 59.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Increase in Heart Disease: A new theory regarding the cause of the increase in deaths from heart conditions is advanced by Henry Albert (*J.A.M.A.*, June 25, 1927). The two reasons commonly advanced are the strenuous life of today and the fact that the average span of life has been increased, more people thus reaching the "heart disease" age. Dr. Albert believes that since heart disease is in large part the result of injury to the organ by infection occurring some years previously, there are living today many more people who have been maimed by scarlet fever and probably many other diseases, including rheumatic fever and syphilis, than there were living ten or twenty years ago. The cumulative increase is estimated at about 50 per cent. Data on other diseases are being gathered.

A Tooth in the Bronchus: The Dental Surgeon (July 2, 1927,) comments editorially on a case which recently came before the justice and a special jury and which is of extreme importance to dentists. A young woman underwent the extraction of three teeth, for which nitrous oxid was administered. One tooth broke, and was aspirated into the bronchus in spite of the efforts of the house surgeon of the dental hospital in which the operation took place. Neither the patient nor her sister who accompanied her was told of the accident, and no report was made of the occurrence to the hospital superintendent. A few days later, the patient developed bronchitis, which went on to pneumonia, with a fatal termination. The mother of the patient brought action against the surgeon and superintendent, and damages were assessed the former in the sum of one hundred and fifty pounds. *The Dental Surgeon* comments: "The mere fact of the tooth being broken does not call for special comment, and the argument of the counsel for the plaintiff that this called for explanation need not be taken too seriously. It is an accident that may happen to any practitioner, and does in fact happen in the practices of the most skilful extractors. The statement of one of the witnesses that about one tooth in every ten is fractured will strike many as being a pessimistic estimate; and every one acquainted with the technic of tooth extraction knows that it is often unavoidable. The essence of the negligence alleged was in allowing the patient to depart without having received any warning that serious consequences might possibly follow, and without any steps having been taken, or advised, to find out what had become of the broken fragment."

Health of a Carnivorous Race: In a study of the health of an entirely carnivorous race, the Eskimos of Greenland, W. A. Thomas (*J.A.M.A.*, May 14, 1927) found no unusual prevalence of vascular or renal disease and entire freedom from rickets and scurvy. In contrast, the Eskimos of Labrador, who live on cooked meats and imported foods, such as dried potatoes, flour, canned goods and cereals, were found to suffer greatly from scurvy and rickets, the latter in spite of the almost constant sunlight.

Treatment of Deep Infections of the Submaxillary Triangle: Submaxillary infections are divided by Colp (*Am. J. Surg.*, June, 1927) into superficial and deep. The former, which are most common, usually form simple abscesses, with fluctuation and tenderness and redness of the overlying skin. The floor of the mouth looks normal and the tongue moves freely. A horizontal incision below and parallel to the mandible carried down through the superficial layer of the deep cervical fascia evacuates the pus, and adequate drainage, aided by wet dressings or dry heat, is followed by cessation of the infection. In deep infections, the patient is very ill. Swelling of the submaxillary region is pronounced,

but the overlying skin is rarely reddened, although edematous. The region is hard and there is no fluctuation. The mouth is opened even slightly only with great difficulty. The tongue is elevated, protruded and fixed and is painful when movement is forced. The floor of the mouth is brawny, endurated, edematous and tender. While some of these deep infections will subside spontaneously or localize, time should not be lost in applying hot wet dressings externally and employing buccal irrigations of hot physiologic sodium chlorid solution internally. Surgery should be resorted to unless improvement is marked in the first twenty-four hours. The author advocates extirpation of the submaxillary salivary gland in preference to a buccal or lateral incision. He says: "At first thought, this may be deemed entirely too radical, too dangerous and even unnecessary. In actual practice, however, this is not the case, for the clinical improvement noticed following this procedure is immediate and marked. Dyspnea invariably disappears, drainage is more free and the patient feels distinctly better. Naturally, in the late cases, where thrombosis and muscular gangrene have occurred and edema of the glottis is present, this operative procedure can be of little avail, it being preferable to perform a tracheotomy simply as a palliative procedure." Local anesthesia is used. The author sounds a warning regarding avoidance of the facial artery, facial vein and lingual blood vessels.

Torus Palatinus: J. E. Lane (*J.A.M.A.*, June 18, 1927) quotes Godlee description of a case of torus palatinus, with the comment that while the anomaly is not uncommon, the name seems to be unknown to many physicians and dentists. He quotes also Merkels' description of the condition: "The suture which unites the two halves of the hard palate in the midline sometimes shows so markedly raised bony borders, that, even in the living subject, a thick and broad elevation may be felt and seen. This fact was noticed many years ago. Chassaignac believed it to be a syphilitic exostosis. Kupffer and Bessel-Hagen thought it to be a peculiarity of East Prussian skulls. Neither view is correct. We must rather look upon the protuberance as an anomaly which in the first place is entirely harmless and which may appear occasionally in any locality." Korner adds that the condition is in many cases hereditary. The author states that patients referred to him have been thought to have sarcoma, syphilitic periostitis or gumma.

Curious Case of Bullet Wound of Jaw: Goldberg's patient was hit in the upper jaw by a bullet. (*U. S. Naval. M. Bull.*) He lost consciousness for two or three minutes. He expectorated a little blood for about thirty minutes. Both central incisors and the right upper cuspid were broken off at the gum border. The tongue was slightly lacerated in the median line for a distance of one-half inch. The bullet passed through the posterior pharyngeal wall just to the left of the median line, and had its exit 1 inch to the left of the sixth cervical vertebra. Except for the loss of three teeth, this patient has no defects in speech, mastication or sensation.—Abstr. *J.A.M.A.*, June 18, 1927.

Scurvy in Unmarried Men: Meulengracht (*Ugeskr. f. Laeger*) reports eight cases of scurvy caused by insufficiency of vitamin C in the food. The patients were unmarried laborers, and had principally been on a diet consisting of bread, butter, cheese, coffee, beer and brandy. The most prominent symptoms were large extravasations of blood in the subcutaneous tissue of the extremities. Hemorrhages into mucous membranes or the internal organs were not observed. Most of the patients presented typical gingivitis, with painful teeth, and anemia. The prodromal symptoms were feebleness, depression, drowsiness, chills, palpitation of the heart and loss of appetite. Six lemons, fresh vegetables and fruit were given daily, in addition to the normal diet. The scorbutic symptoms rapidly disappeared. Administration of iron increased the hemoglobin.—Abstr. *J.A.M.A.*, June 11, 1927.

Acute Osteomyelitis of the Jaw Bones: The author (P. Galli, in *Clin. pediat.*, October, 1926) reports a case of B. coli septicemia with primary localization in the intestinal tract in a child, aged 4 years. There was later localization in the liver and kidneys. The illness pursued a tempestuous course for four weeks, when signs of an osteomyelitis involving the maxilla and mandible became evident. This the author believed to be of hematogenous origin and not due to external infection. The child recovered. —Abstr. *Am. J. Dis. Child.*, May, 1927.

Announcements

CALENDAR OF MEETINGS*

NATIONAL SOCIETIES

American Academy of Periodontology, October 20-22, 1927, Detroit, Michigan.

American Association of Dental Schools, March 26-28, 1928, Washington, D. C.

American Dental Assistants Association, October 25-27, 1927, Detroit, Michigan.

American Dental Golf Association, October 24-28, 1927, Detroit, Michigan.

American Dental Hygienists Association, October 24-28, 1927, Detroit, Michigan.

American Dental Association, October 24-28, 1927, Detroit, Michigan.

American Dental Trapshooters League, October 24-28, 1927, Detroit, Michigan.

American Society of Oral Surgeons and Exodontists, October 21-22, 1927, Detroit, Michigan.

American Society of Orthodontists, April 30-May 1-3, 1928, Buffalo, N. Y.

American Society of Pedodontists, October 28, 1927, Detroit, Michigan.

National Association of Dental Examiners, October 22, Book-Cadillac Hotel, Detroit, Michigan.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesday in each month from October to June inclusive.

October (1927)

Florida, at St. Petersburg.

December (1927)

Ohio, at Cleveland (6-8).

February (1928)

Minnesota, at Minneapolis (Feb. 29-March 2).

March (1928)

Louisiana, at Shreveport.
Montana, at Missoula (29-31).

April (1928)

California at Stockton (9-12).
Maryland, at Baltimore (April 30-May 2).
North Carolina, at Greensboro (16-18).

May (1928)

Missouri, at Kansas City (14-18).
New York, at Syracuse (16-18).

Chicago Dental Society, at Chicago, January 24-26, 1928.

MEETING OF STATE BOARDS OF DENTAL EXAMINERS

Connecticut, at Hartford, November 15-17, 1927. Recorder, Arthur B. Holmes, 80 Central Avenue, Waterbury, Connecticut.

Indiana, at Indianapolis, November 14, 1927. Secretary-Treasurer, J. M. Hale, Mt. Vernon, Indiana.

Massachusetts, at Boston, October 17-19, 1927. Secretary, W. Henry Grant.

Michigan, at Ann Arbor, November 14-19, 1927. Secretary, J. W. Lyons, 617-621 Dwight Building, Jackson, Michigan.

New Jersey, at Trenton, December 5-10, 1927. Secretary, John C. Forsyth, 148 W. State St., Trenton, New Jersey.

*Announcements must be received by the ninth of the month in order to be published in the forthcoming issue of THE JOURNAL.

MISSOURI STATE DENTAL ASSOCIATION

The next meeting of the Missouri State Dental Association will be held at Kansas City, in the Shrine Temple, May 14-18, 1928.

A. J. THOMPSON, *Editor*,
Shukert Bldg.,
Kansas City, Mo.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK

The sixtieth annual meeting of the Dental Society of the State of New York will be held at the Hotel Syracuse, Syracuse, May 16-18, 1928.

A. P. BURKHART, *Secretary*,
57 E. Genesee St.,
Auburn, N. Y.

CONNECTICUT DENTAL COMMISSION

The Connecticut Dental Commission will meet at Hartford, Nov. 15-17, 1927, to examine applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before them. For further information, apply to

ARTHUR B. HOLMES, *Recorder*,
Connecticut Dental Commission,
80 Central Ave.,
Waterbury, Conn.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

The Massachustts Board of Dental Examiners will hold an examination for registration for both dentists and oral hygienists in the City of Boston, Oct. 17-19, 1927. Full information, application blanks, etc., may be secured at the office of the secretary, Room 146, State House, Boston. All applications must be filed at the office of the secretary at least ten days before the date set for the examination.

W. HENRY GRANT, *Secretary*.

MICHIGAN STATE BOARD OF DENTISTRY

The Michigan State Board of Dentistry will hold its next examination for registration of both dentists and oral hygienists at the Dental College building, University of Michigan, Ann Arbor, Nov. 14-19, 1927. The examination begins at 8 a. m. All applications must be on file in the secretary's office thirty days before the date of the examination. For information and blanks, address

J. W. LYONS, *Secretary*,
617-621 Dwight Bldg.,
Jackson, Mich.

PAST PRESIDENT'S LUNCHEON

The annual luncheon of the Past Presidents of the American Dental Association will be held at the Hotel Statler, Detroit, Mich., Wednesday, October 26, at 12:10 p. m.

SHEPPARD W. FOSTER,
711 Peachtree St.,
Atlanta, Ga.

REORGANIZATION OF THE AMERICAN SOCIETY OF PEDODONTISTS

An organization of all dentists interested in pedodontia and its relative phases of prevention is to be established in Detroit at the time of the Annual Session of the American Dental Association in October. All practitioners of dentistry or those in relative fields interested in this work shall be eligible for membership:

a. Those limiting their practice to the care of children's teeth, whether in private practice or in public health institutions, shall be eligible to active membership.

b. Associate membership (nonvoting) shall be available to all others. Other specifications and regulations for procedure shall be decided at the meeting.

Please communicate with the undersigned if you are interested in joining the organization, to be known as the American Society of Pedodontists, either as an active or an associate member, stating whether you will be present at the reorganization to be held at the General Motors Bldg., Detroit, Mich., Wednesday, October 28, at 12:30 p. m.

SAMUEL D. HARRIS,
412 Kresge Bldg.,
Detroit, Mich.

AMERICAN ASSOCIATION OF DENTAL SCHOOLS

The fifth annual meeting of the American Association of Dental Schools will be held at the Mayflower, Washington, D. C., March 26-28, 1928.

DeLos L. Hill, *Sec'y-Treas.*,
1206 Medical Arts Bldg.,
Atlanta, Ga.

WOMAN'S AUXILIARY, A. D. A.

The annual meeting of the Woman's Auxiliary of the American Dental Association will be held Monday morning, Oct. 24, 1927, at 10:30, at the Book-Cadillac Hotel, Detroit, Mich. All members are urged to attend.

Mrs. DeLos L. Hill, *Secretary.*

ALPHA OMEGA FRATERNITY

The preconvention meeting of the Supreme Council of the Alpha Omega Fraternity will be held, Monday, Oct. 24, 1927, at the Savoy Hotel, Detroit, Mich., and will be followed by a dinner for all attending fraters. Those expecting to attend, please notify J. T. Rothner, 8786 Linwood Ave., Detroit.

By order of

Alvin H. Berman, *Supreme Chancellor.*
A. M. Flaschner, *Supreme Scribe*,
419 Boylston St.,
Boston, Mass.

Note.—Fraters: A new directory is to be published. Your full name, address and school with class year is requested.

CORRECTION

The name of Dr. Matthew N. Federspiel was given erroneously as Michael N. Federspiel in connection with the authorship of an article read before the Seventh International Dental Congress and published in the September issue of The Journal, page 1698.

PALASTINE CATASTROPHE

The Dentists Committee of the University of Palastine, of which Herman E. S. Chayes is chairman, is making an appeal to the profession for funds for Palastine University which was seriously damaged in the recent earthquake in the Holy Land. In order that every member of the profession may find it convenient to contribute, the Committee is soliciting small subscriptions.

The Committee is also accepting memberships at $5.00 per annum for the purpose of erection and maintenance of buildings for the dental department. Your assistance will be very helpful. Checks should be mailed to Samuel Abraham, Secretary, Dentists Committee of the University of Palastine, 111 West 86th Street, New York City.

AMERICAN DENTAL GOLF ASSOCIATION

The ninth annual golf tournament of the American Dental Golf Association will be held at the Hawthorne Valley Golf Club, Detroit, during the week of Oct. 24, 1927. All members of the American Dental Association are cordially invited to join the golf association and participate in the tournament play, for which valuable prizes will be awarded. There will be no special tournament day this year, foursomes choosing their time and reporting to a club professional before and after play, in order to avoid conflicting with the American Dental Association program.

The annual golf banquet will be held at the Hotel Statler, Detroit, Sunday, October 23, at 6:30 p. m.

Register before the banquet if possible at the Hotel Statler or with the tournament chairman. There are no annual dues. Once a member, always a member. Bring accredited handicap from your club professional.

Albert Leland LeGro,
525 David Whitney Bldg.,
Detroit, Mich.

AMERICAN DENTAL HYGIENISTS ASSOCIATION

The officers and members of the program committee of our American Dental Hygienists Association have worked diligently to obtain a program for our annual meeting in October which will be of vital interest to every dental hygienist in the country. Let us be loyal to them and to ourselves by doing our utmost to attend these sessions.

Following is the tentative program:

Convention Headquarters, Hotel Statler, Detroit, Mich.

Monday, October 24

Registration all day

10:00 a. m. Meeting of board of trustees
1:30 p. m. Meeting of house of delegates
2:30 p. m. Address of welcome
Reply
President's address

Tuesday, October 25

9-11:30 a. m. "The Dental Hygienist in the School."

A demonstration of the work of the hygienist in the classroom to be given in one of the public schools of Detroit.

Afternoon devoted to meetings of various boards.

Wednesday, October 26

Clinic by Paul R. Stillman. Fee $3.00. Held at General Motors Building.

Sessions at 9:00 a. m., 10:30 a. m., 2:00 p. m. and 3:30 p. m.

Afternoon—Meetings and reports of committees.

7:00 p. m.—Banquet and dance at Hotel Statler.

The entertainment committee is planning interesting trips around Detroit, among them a trip to the Ford plant.

HELEN ROSENTHAL, *Chairman*,
Publicity Committee.

BOOK REVIEWS

The Foundations of Nutrition. By Mary Swartz Rose, Ph.D., Professor of Nutrition, Teachers College, Columbia University. 501 pages. Published by The MacMillan Company, New York.

This book is not merely a dissertation on diet—it is something more than that. It deals with the subject of metabolism; and goes rather in detail into the much-talked-of but little understood question of vitamins. As the author says in her preface: "This book is written for those who wish to live more intelligently." To this end the last ninety pages of the book are taken up with the subject of "The Construction of an Adequate Diet;" and every conceivable need is considered, from the diet of a one-year-old child to that required by an average family of father, mother and several children.

To list the number of suggested diets would be a task in itself, to say nothing of the reasons given for the various ingredients. This book merits a careful study, and after this study we cannot escape the conviction that what the average American family most needs is a slight rearrangement of the food materials they are using today, and a more intelligent proportioning of these materials instead of any radical change in the foods themselves. If the coming generation is not better nourished and stronger than the present one, it will not be for lack of discussion of nutrition; and the present volume is a very noted addition to the literature of the subject.

Pyorrhea Alveolaris, Its Etiology, Pathology, Symptoms, Sequelae and Treatment. By F. St.J. Steadman, D.P.H., L.R.C.P. (London), M.R.C.S., L.D.S. (Eng.), Dental surgeon and lecturer on dental diseases in children, local anesthesia and bacteriology, Royal Dental Hospital; dental surgeon to West London Hospital; late dental surgeon and lecturer on dental histology, National Dental Hospital; dental surgeon to the Metropolitan Hospital, and to the Belgrave Hospital for Children. 42 illustrations and 36 plates. 263 pages. Price $9.25. Published by C. V. Mosby Company, St. Louis, Mo.

There is a laudable attempt in this book to emphasize the importance of clearing up a mouth affected with pyorrhea alveolaris. It has long been recognized that any condition of the mouth which results in the constant flow of pus has possibilities for harm to the system, and this fact has been so frequently stated in our literature as to become axiomatic. But with this subject as with others, there is danger that the imagination of the man who dwells constantly on one topic may carry him beyond the bounds of probability. Doubtless much harm has been done by pyorrhea alveolaris, but to attribute nearly every disease in the category to this affection—even such disorders as cancer of the rectum—must give the reader pause, and make him raise a question.

This book, as indeed all books on a speculative subject, must be read with an open

mind to get the greatest benefit from it, and the reader must discriminate and select from the great amount of material which the author has so painstakingly prepared those portions which appeal to him as applicable to every-day practice, and not dwell too long on theories which may be held as still open to debate.

The mechanical makeup of the book is good, and the plates and other illustrations are excellent—a credit alike to publisher and author.

Dental Alloys. Three lectures. Delivered under the auspices of, and published by, The Dental Board of the United Kingdom. 72 pages. Price, 5 shillings net. 44 Hallam Street, W.I., London, England.

These lectures were delivered in 1926 at the Universities of Edinburgh, and Manchester, and at the Royal Dental Hospital of London. They were intended to further postgraduate study, and include such subjects as structure, constitution and properties of metals and alloys; pure metals, alloys and amalgams, and the treatment of metals and alloys by casting, rolling, pressing, swaging.

They were prepared by Walter Rohenhein, superintendent, Metallurgy Department, The National Physical Laboratory; and are illustrated by 99 cuts. The book will well repay a careful perusal by any one interested in the subject.

Practical Pedodontia, or Juvenile Operative Dentistry, and Public Health Dentistry. An introductory text for students and practitioners of dentistry. By Floyde Eddy Hogeboom, D.D.S., instructor in pedodontia, College of Dentistry, University of Southern California; former member of Children's Hospital, Los Angeles; former member of the Health and Development Department, Pasadena City Schools. Second edition, 108 pages. Price $3.50. Published by C. V. Mosby Company, St. Louis, Mo.

That a second edition of this splendid work is demanded so soon is a healthy sign of the times. More and more must the attention of the profession be directed toward the problem of preventing dental disease in children. It is the most significant thing in dental practice today; and this book is intended as a means to this end. Dr. Hogeboom has brought to his work an enthusiasm and a seriousness of purpose which constitute the best equipment for producing a useful and dependable book, and we commend this volume to the attention of all those who are interested in the subject. If its precepts are followed, our children will be better cared for than they have been in the past, and this is something devoutly to be desired.

SOME "STAND-BYS"

Which you may borrow from

THE DEPARTMENT OF LITERARY RESEARCH

AMERICAN DENTAL ASSOCIATION

A deposit of $2.00 is required for each book.

Black, G. V.	Operative dentistry. 2 vols. Chicago, Medico-Dental Pub. Co., 1920.
Brophy, T. W.	Cleft lip and palate. Philadelphia, Blakiston, 1923.
Campbell, D. D.	Full denture prosthesis. St. Louis, Mosby, 1924.
Capon, W. A.	Porcelain dental restorations. Philadelphia, Lea & Febiger, 1920.
Case, C. S.	Technics and principles of dental orthopedia and prosthetic correction of cleft palate. Chicago, C. S. Case, 1921.
Davis, W. C.	Essentials of operative dentistry. St. Louis, Mosby, 1923.
Fones, A. C.	Preventive dentistry. Philadelphia, Lea & Febiger, 1925.

Gregory, W. K.	Origin and evolution of the human dentition. Baltimore, Williams & Wilkins, 1922.
Johnson, C. N.	Textbook of operative dentistry. Philadelphia, Blakiston, 1923.
Kells, C. E.	Dentist's own book, including a complete bookkeeping and recording system and a description of the management of a dental practice. St. Louis, Mosby, 1925.
LeGro, A. L.	Ceramics in dentistry. Brooklyn, Dental Items of Interest Pub. Co., 1925.
Moorehead, F. B. & Dewey, Kaethe W.	Pathology of the mouth. Philadelphia, Saunders, 1925.
Nevin, Mendel, & Puterbaugh, P. G.	Conduction, infiltration and general anesthesia in dentistry. Brooklyn, Dental Items of Interest Pub. Co., 1924.
Noyes, Edmund	Ethics and jurisprudence for dentists. Chicago, Conkey, 1923.
Sampson, C. M.	Physiotherapy technic: a manual of applied physics. St. Louis, Mosby, 1923.
Steadman, F. St.J.	Local anaesthesia in dental surgery. Philadelphia, Blakiston, 1923.
Stillman, P. R. & McCall, J. O.	Textbook of clinical periodontia. New York, MacMillan, 1922.
Taylor, J. A.	History of dentistry. Philadelphia, Lea & Febiger, 1922.